FINNISH ROAD ADMINISTRATION

Estonian Road Traffic Safety Audit Project

Highway 3 Jõhvi-Tartu-Rõngu

julkaisuaika : 2002 ?

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Abbreviations

app.	approximately
Finnra	Finnish National Road Administration
NMT	non-motorised traffic
ERA	Estonian Road Administration
km	kilometre
beg.	beginning
AT	the Audit Team
No/Nr.	number
vpd	vehicles per day

SUMMARY

The use of a road traffic safety audit system has increased rapidly since beginning of the 1990's, when it was first developed in the United Kingdom. Since then several countries of Western Europe and on the southern hemisphere have adopted the audit system. The purpose of this study is to clarify the principles of the auditing methods and develop audit procedures, which are suitable for Estonian conditions.

The number of traffic deaths decreased in Estonia after it regained its independence in the beginning of 1990's. Before that the amount of traffic fatalities has risen very rapidly. After the re-independence of 1991 the amount of traffic deaths has varied between 200 and 400. At last 5 years the amount of fatalities has an average of about 250 traffic deaths per annum despite of yearly increasing vehicle density.

The Road Traffic Safety Audit is not a recognised system in Estonia yet. A couple of traffic safety audits have been prepared to the Estonian main road network. These audits were made by either Finnish or Swedish experts. There are also no further plans for adopting the audit method. On the other hand Estonia has a privilege to other Baltic states while there are more resources to traffic safety work. Every road region (county) has a responsible person in the area of traffic safety.

The check lists, which were used in this project, can be further modified to suit different types of roads (e.g. in urban road). They are normally divided and defined according to several road and traffic characteristics, which have influence on traffic safety. In addition to this, the both general and detailed recommendations are given, in order to improve the traffic safety on the highway no 3. The audit team's opinion of the safety audit methodology, which is suitable for Estonian conditions, is also described.

The ERA had selected Highway No 3, Jõhvi-Tartu-Rõngu, as the target of the safety audit. Highway 3 is major north-south connection in the eastern part of Estonia. The completed audit method for the existing road was tested in a case study of Highway No 3. Before the audit of the road the accidents and traffic volumes were analysed. Due to the length of the audited section (almost 180 km) the audit results are presented in two parts: general, and detailed recommendations. The detailed audit focused on most hazardous locations and sections with several accidents.

The recommendation to the auditing system is following; first of all new projects and plans are audited in order to get same safety standards for the new road arrangements, besides all plans in the area of municipality (e.g. local streets) could be audited. Depending on the resources the auditing of the existing roads should be considered. Important, when choosing the auditing personnel, is that same person or group of traffic safety experts could perform the audits nation wide in order to perform the same plan of action. The auditing of the existing roads could be repeated every 5...10 years for the same road.

1 INTRODUCTION

The use of a road traffic safety audit system has increased rapidly since beginning of the 1990's, when it was first developed in the United Kingdom. The developing phase had started already in the 1980's. Since then several countries in Western Europe and on the southern hemisphere have adopted the audit system.

The introduction of traffic safety is quite open in Estonia. Estonia has although more resources than other Baltic states for traffic safety while every road region has one traffic safety expertised person. ERA headquarters in Tallinn has a traffic division, where some people are responsible for traffic safety. To ensure the audits' similitude, the audits should be performed in a common way nation wide. The audits would need either similar guidebook or same group (person) on carrying out them.

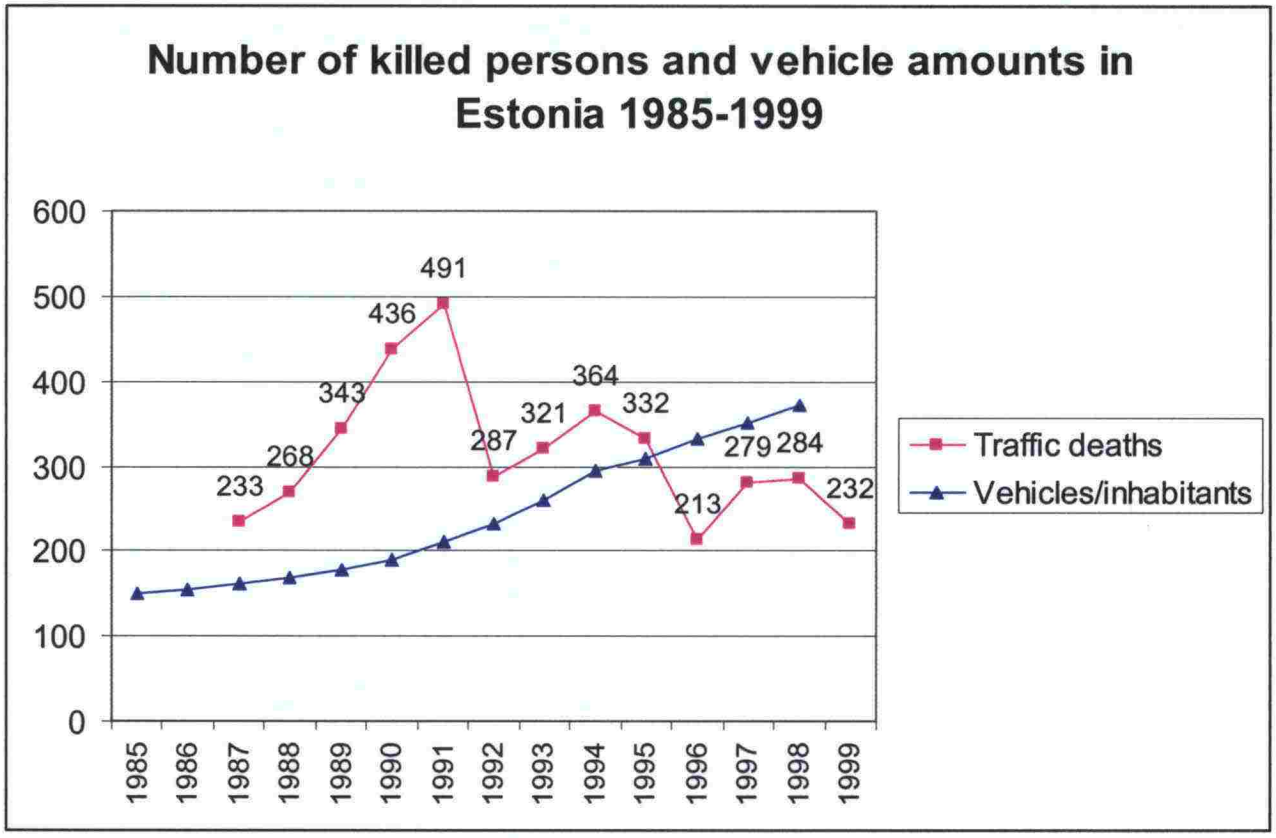
In Finland the auditing process has been developed since 1995. Several auditing systems have been tested in Finland in developing the most suitable one. The final audit system has not been standardised yet. New project is planned in 2001 in order to find the most suitable system to Finnish conditions. A similar method to traffic safety audit is used when defining the most hazardous spots in the regional traffic safety plans. As an addition to the Finnish method several interviews are passed in order to specify the dangerous spots, which need reorganising.

The purpose of this study is to clarify the principles of the auditing methods and develop audit procedures, which are suitable for Estonian conditions. The proposed system was tested in a case study dealing with traffic safety of the existing Highway No 3 from Jõhvi towards Tartu and further to Valga in Latvia. The section is situated in the counties of Ida-Virumaa, Jõgeva and Tartu. The length of the audited highway No 3 is 179 km. A basis for this work was created during similar projects in Lithuania and Latvia, where the E77 (A12 from Joniskis to Siualiai and Taurage in Lithuania and A8 from Riga to Jelgava and Eleja in Latvia) were audited in case studies. The description of the procedures and the results of the case study including the protocols and checklists are included in this report.

The traffic safety audit and the system development were carried out by the Finnish Road Administration (Finnra). Finnra's Central Administration was represented in this project by Mr. Arto Tevajärvi, from the International Affairs. This report was prepared by Mr. Bilal Atiye and Mr. Ismo Heikkinen from Finnish Road Enterprise and Mr. Margus Nigol from IB Stratum, local consultant from Tallinn. Mr. Harri Kuusk and Mr. Reigo Ude represented the Estonian Road Administration (LRA) in this project as the local traffic safety experts.

2 GENERAL ROAD SAFETY SITUATION IN ESTONIA

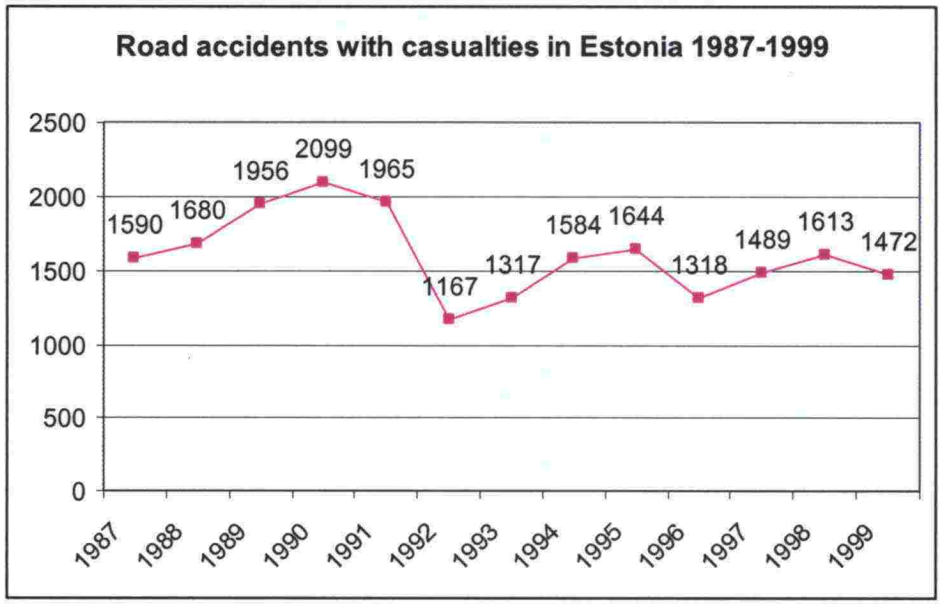
The number of traffic deaths decreased in Estonia after it regained its independence in the beginning of 1990's. Before that the amount of traffic fatalities has risen very rapidly. After the re-independence of 1991 the amount of traffic deaths has varied between 200 and 400. At last 5 years the amount of fatalities has an average of about 250 traffic deaths per annum despite of yearly increasing vehicle density. The vehicle density and amount of killed persons in traffic are shown in the picture 2.1.



Picture 2.1. Number of killed persons and vehicle amounts in Estonia.

The amount of accidents with casualties (either fatalities or injuries) decreased after re-independence to a new level. Since that the amount of all traffic casualties has been near 1500 casualties per annum. The development of the casualties is shown in the picture 2.2.

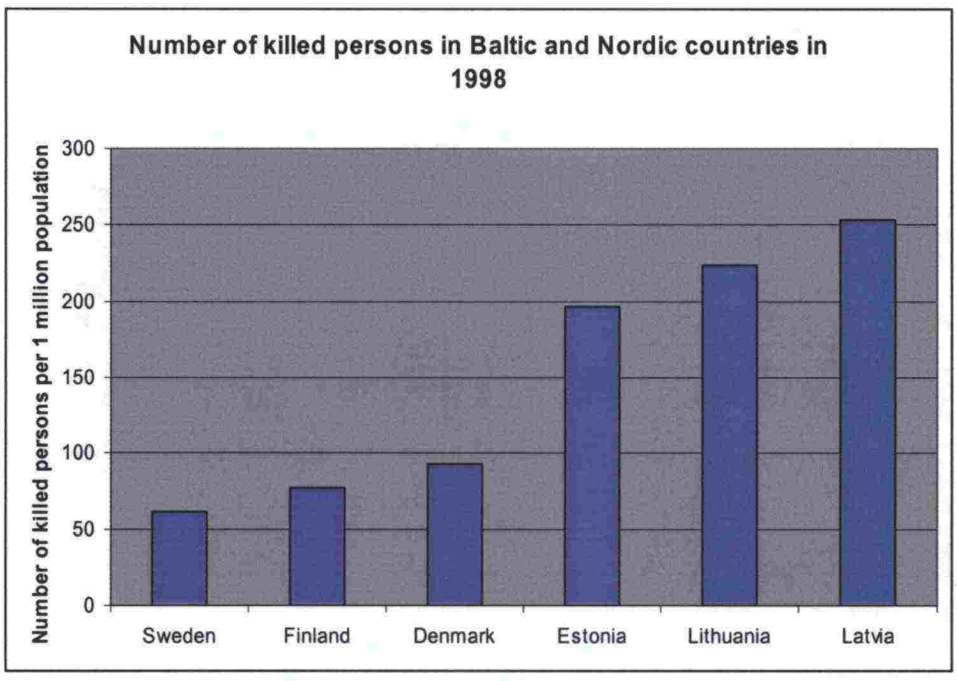
One major reason relating to the accidents is the lighting. About one half of all fatal accidents happens during the dark time. The pedestrians and the bicyclists seem to form one third of all victims of road traffic.



Picture 2.2. Number of casualties in Estonia in 1987-1999.

The number of traffic fatalities per person is much higher level in the Baltic States than in Scandinavia. This can be seen in the picture 2.3, where the comparison of the traffic safety between Estonia and some other countries is presented. There happens almost three times more fatalities in relation to inhabitants in Estonia than in Scandinavia as average. The situation is although better in Estonia than in other Baltic states Lithuania and Latvia.

To get these figures nearer to the Scandinavian figures several acts need to be done. Similarly with effective traffic safety work of responsible authorities the importance of traffic safety work has to be recognised on the highest governmental level. Also sufficient resources must be reserved in order to get results from this work.



Picture 2.3. Number of killed persons per population in road accidents in some countries in 1998.

3 ROAD TRAFFIC SAFETY AUDIT PROCEDURE

3.1. What is road traffic safety audit?

The Road Traffic Safety Audit is a systematic method of checking the traffic arrangements against the required safety standards. The safety audit is normally part of the design's quality system, but it can be used to audit the safety of existing roads. The audit team usually includes road safety, road design and maintenance specialists, and a police officer. Using checklists for predefined safety issues carries out the safety audit. All findings and recommendations are presented in a safety audit report.

3.2. Development in Estonia

The Road Traffic Safety Audit is not a recognised system in Estonia yet. A couple of traffic safety audits have been prepared to the Estonian main road network. These audits were made by either Finnish or Swedish experts. There are also no further plans for adopting the audit method. On the other hand Estonia has a privilege to other Baltic states while there are more resources to traffic safety work. Every road region (county) has a responsible person in the area of traffic safety.

Traffic safety work lacks also of sufficient financial resources. Priority is more often given to development of the main road network, when old surfaces are repaved and re-equipped (guidance, guide posts). It is quite clear that these actions improve also traffic safety. Traffic safety personnel should be attended to these large-scale actions in order to prevent hazardous operations. Quite effective could be if traffic safety expert(s) make(s) the audits of the major plans before they are implemented.

Traffic safety audit work concentrates both major and minor actions that could improve traffic safety. During the auditing of the existing roads also inexpensive actions are invented. These actions could normally be performed quite rapidly. For example, in Road Regions of Finland the budget contains normally minor financial resources simply for traffic safety improvements.

3.3. Objectives of the Project

The goal of this project is to introduce a traffic safety audit system in Estonia. Experience from other countries shows that adopting the traffic safety audit system will lead to identification of effective traffic safety improvements and, when implemented, improve traffic safety. The auditing procedures are very similar from country to country. General auditing system, which would take every possible details and circumstances into account, hasn't proved successful so far. Therefore, the checklists are often prepared for auditing different types of road design phases, improvement schemes and different types of roads.

The checklists were prepared for this project as an example, which can be used both when auditing other existing roads and when developing the audit system further. The case-study was performed in order to demonstrate the system in practise and to introduce some improvement methods for the particular road. Eventually this report was prepared in order to finalise the ideas invented during and after the field study.

The main goal for auditing the traffic safety on existing roads is to verify the characteristics of the road (alignment, traffic arrangements and road furniture etc.), which are not in harmony with the standards of that particular type of road. When the standards of the road are homogenous, the road will give a safe impression to the road users.

3.4. Audit characteristics

The safety audit of an existing road differs from auditing of a road design. When auditing an existing road, accident information and other empirical information can be used as basic information for auditing. Different road user groups can be interviewed when auditing the safety of existing roads. The audit will point out the characteristics and elements, which are not corresponding to the required standards. These findings are normally presented in the field audit report.

The final report of the safety audit consists of recommendations for traffic safety improvements. After auditing it is very important to estimate how and when the recommendations of the auditing report will be realised.

One method of maintaining constant development toward improving the traffic safety of existing roads is to audit whole road network systematically and regularly. Auditing usually identifies locations, where the most effective safety improvements should be implemented. Systematic auditing will normally produce information on the typical defects and factors, which might hazardous to road safety. With this knowledge the hazardous factors can be taken into account already in the design of future road.

Normally, the auditors familiarise themselves with the existing designs, simultaneously with the safety audit. New designs and plans are reviewed to analyse their general impact on the changes of traffic safety in the road network.

The safety audit should be done on different occasions; different time of day and different time of year, to get the most comprehensive results. It is recommended that in this case study local traffic safety experts check the effects of winter maintenance and winter conditions on the road. In other words the audit should be repeated during the wintertime.

During the safety audit it is also customary to identify the most important non-physical impacts. These are e.g. driving behaviour and drunk driving. In some cases these kinds of factors can be a main cause for accidents.

3.5. Study Methodology

The safety audit in Estonia focused on developing a suitable methodology for the safety audit of existing roads. This included description of instructions for the method as well as preparation of checklists for auditing existing roads. The basis and the checklists for this work were created during the similar projects in Latvia and Lithuania in autumn 2000.

Development of the road safety audit system in Estonia was divided into two stages:

- Development of the procedures and suitable check-lists (done mostly during the similar projects in other Baltic states).
- The case study, which was carried out on one of the main north-south-road links in Estonia; for highway no 3 from Jõhvi towards Tartu and Rõngu.

The case study was done in co-operation with the ERA and with the assistance of Estonian road safety experts.

Before the field visit the auditing team studied the accident statistics of Highway 3. The purpose of the accident analysis was to identify the road sections where the field auditing needs to be done in great care. The location and types of accidents as well as the fatality rate (number of casualties in

each accident) were recorded. This lead to the identification of the accident "black spots". An accident black spot is a location where accidents are more frequent than on average on that road according to accident density or accident rate. The analysis of accident statistics took place before the case study with the help of the Estonian traffic safety expert. The analysis was complemented during the finalisation of this report. Traffic volumes were also clarified for the calculation of accident rates.

3.6. Use of the checklists

The safety audit team used checklists, which include specific technical questions, in the field audit. It is necessary that the auditors are familiar with the terminology and the technical issues related to these checklists. Although the lists are more often used to audit designs or studies it has been found useful to use the lists when auditing existing roads as a reminder of the issues to be checked and to familiarise new auditors in matters effecting traffic safety.

In this case study the questions in the checklists were divided into seven groups. Contents of the checklists are as follows:

1) Geometry of the road
   - Alignment, gradient and visual ranges
   - Cross-section
   - Road shoulders
   - Sidefall, drainage
   - Pavement
2) Intersections
3) Transport modes and land-use
   - Non-motorised traffic (NMT)
   - Public transport
   - Parking
4) Driver issues
   - Speed limits
   - Overtaking
   - Accidents and driving behaviour
5) Maintenance and Road works
6) Traffic control
   - Road signs and road markings
   - Traffic lights
7) Road furniture and special structures
   - Bridges
   - Tunnels
   - Lighting
   - Plants
   - Other equipments

These lists can be further modified to suit different types of roads (e.g. in urban road). They are normally divided and defined according to several road and traffic characteristics, which have influence on traffic safety. A camera or video equipment can be used to record field conditions and finalise the audit at the office.

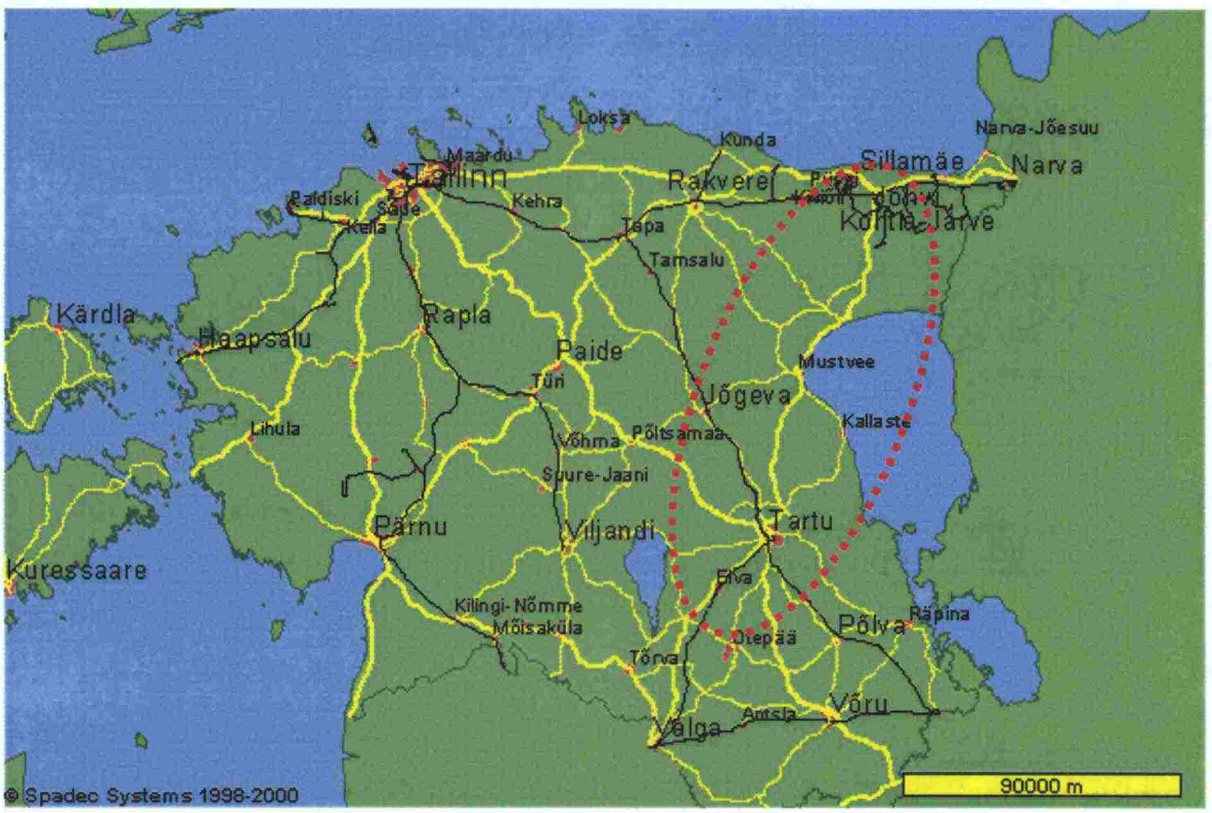
4 PREPARATIONS OF THE CASE-STUDY ON HIGHWAY 3

4.1. Some general information of the audited highway

The ERA had selected Highway No 3, Jõhvi-Tartu-Rõngu, as the target of the safety audit. The reason for the selection was, that accident analyses were performed to roads no 1 from Tallinn towards Narva and St. Petersburg, no 2 from Tallinn towards Tartu and no 5 from Rakvere towards Pärnu earlier. Location of the highway 3 in the Estonian main road network is presented in the picture 4.1.

Highway 3 is major north-south connection in the eastern part of Estonia. Its starting point is in the intersection of highway 1, situated northwest of Jõhvi. The highway goes then through Jõhvi and turns direct to the south. From Rannanpungerja to Mustvee the highway situates quite near to the lake Peipsijärv. After Mustvee the highway heads towards Tartu, penetrates the city itself and turns then forward towards Valga. The audited part of the highway ends just south of Rõngu, on the border of Tartu and Valga counties.

The completed audit method for the existing road was tested in a case study of Highway No 3. Before the audit of the road the accidents and traffic volumes were analysed. Due to the length of the audited section (almost 180 km) the audit results are presented in two parts: general, and detailed recommendations. The detailed audit focused on most hazardous locations and sections with several accidents.



Picture 4.1. Highway 3 in the Estonian main road network.

4.2. Basic Data for the Safety Audit

4.2.1. Accident Data

Before the site-visit, the members of the auditing team familiarised themselves with the accident history of Highway No 3 and its traffic volumes. The road was divided into six sections, which are presented in table 4.1. Each section has quite similar cross-section and the level of traffic volume (see also picture 4.2.). The beginning and end points are located near towns or county borders. The recently constructed section between Elva and Kalme (Elva by-pass) formed also an own section. The accident history was taken into account from almost 6 years (1995-2000/November). Only accidents with casualties (fatal and injured) were included in the analysis. The construction of the by-pass of Elva (section Elva-Kalme south of Tartu) was finalised in autumn 2000. The accident history between Elva and Kalme is therefore presented from the old part of the highway 3.

The audit team familiarised also with the traffic volumes, speed limits and pavement and shoulder widths of the highway 3. Mostly the speed limit was 90 km/h (general speed limit) along the road. The width of the pavement was mostly 8...9 metres, giving the carriageway a width of 7...8 metres. The gravel shoulder width was mainly between 1...2 metres according to the road register. There was some confusion (speed limits) between the information of the road register and the actual situation on the field.

In Jõgeva county also other accident data than only after 1994 and casualties were put to use. Accident data reached till year 1992 and all accidents reported to police officers were looked after. A list of these accidents is presented in the annexes of this report.

Table 4.1. Sections and some basic data for Highway 3.

Section name	Km at beg.	Km at end	Length	Traffic volume	Fatalities	Casual-ties	People killed	People injured	Accident density / km	Accident rate / million driven km	Risk of death / million driven km
Jõhvi-Mustvee	4,7	73	68,3	910...2410	10	37	15	45	0,11	0,20	0,08
Mustvee-Igavere	73	111	38,0	940...1250	6	20	6	32	0,11	0,27	0,08
Igavere-Tartu	111	129,8	18,8	1250...3520	4	23	4	31	0,24	0,30	0,05
Tartu-Elva	137,2	159	21,8	4730...5500	5	31	5	41	0,28	0,15	0,02
Elva-Kalme	159	166	7,0	2280...2280	1	10	1	15	0,29	0,23	0,02
Kalme-Rõngu	166	180	14,0	1000...2280	4	14	4	23	0,20	0,32	0,09

Accident rate is the relation between the number of accidents and driven vehicle kilometres on the particular road section. Accident density is the relation between the number of accidents and the section's length. Usually comparing both figures section by section makes the definition of dangerous sections. The figures in table 4.1. show that according to the accident density, the most dangerous sections are the ones nearest to Tartu. The traffic volumes are highest on these sections. According to the accident rate the most dangerous sections are Igavere - Tartu and Kalme-Rõngu. The risk of death is the greatest along the beginning part Jõhvi-Mustvee-Igavere and Kalme-Rõngu. The amount of fatalities is greatest in the beginning part of the highway on the section Jõhvi-Mustvee. All in all according to these figures it is hard to give some sections more value than to the others, when defining and prioritising the actions for improving traffic safety. Only the last section seemed to be more dangerous than the others when comparing the average figures.

The distribution of different accident types for each section is presented in table 4.2.

Table 4.2. Sections and accidents in different types for highway 3.

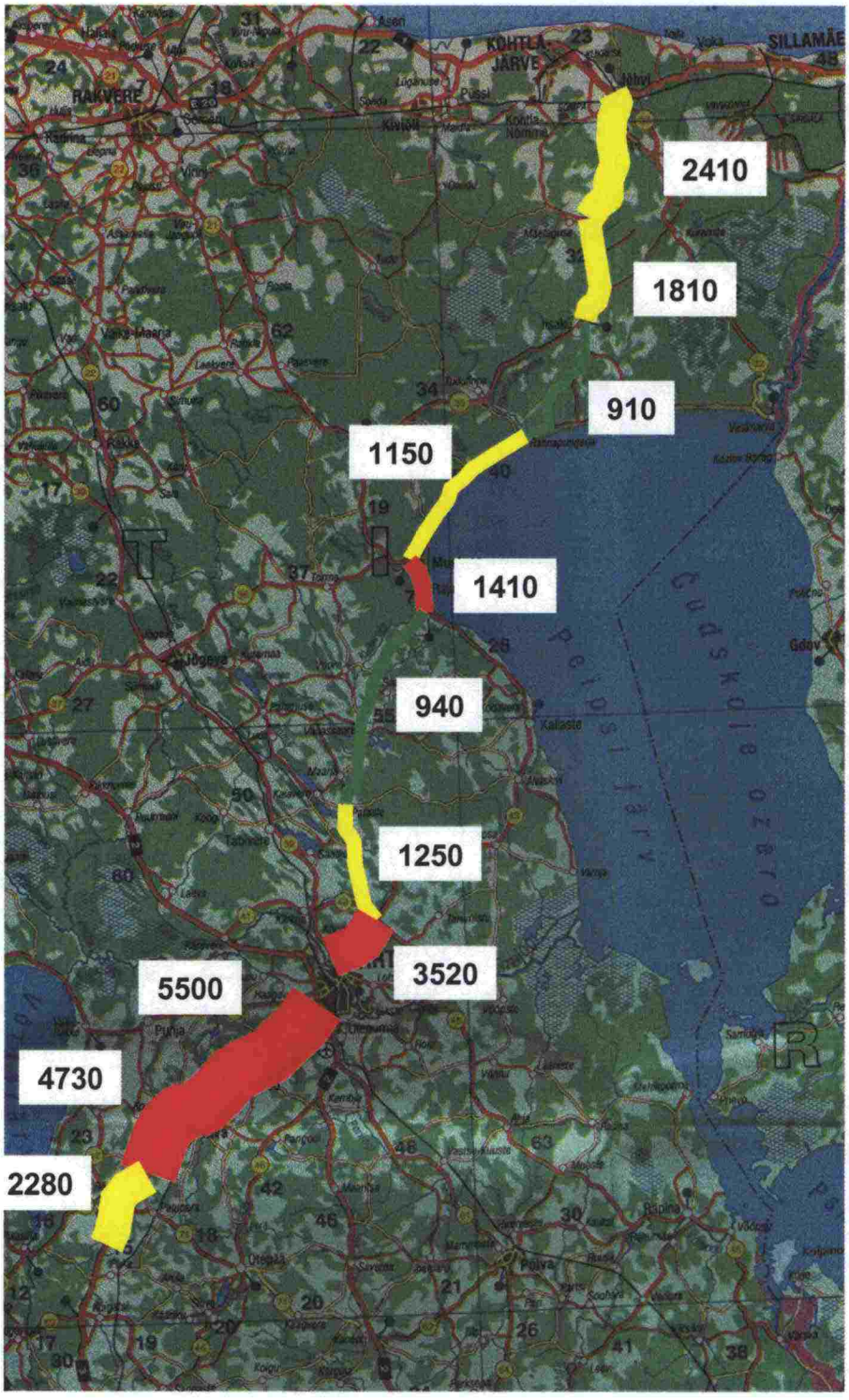
Accidents type	Section name						
	Jõhvi-Mustvee	Mustvee-Igavere	Igavere-Tartu	Tartu-Elva	Elva-Kalme	Kalme-Rõngu	**Grand Total**
Collision with bicycle	2		2	3	1	3	**11**
Collision with moped	1					1	**2**
Collision with pedestrian	8	3	2	10	3	3	**29**
Head-on collision	4	2	2	9	2	2	**21**
Rear-end collision	1		1	2	1	2	**7**
Collision with stopped vehicle	0	2		1			**3**
Side collision	0	3	4				**7**
Running of the road	18	8	11	5	3	3	**48**
Turnover	2	2	1				**5**
Animal accident				1			**1**
Other accident	1						**1**
Total	**37**	**20**	**23**	**31**	**10**	**14**	**135**

The most common accident type is running of the road/turnover, which comprises about 40 % of all accidents. Between Jõhvi and Tartu a half of all accidents represent that type. This accident type is related very often to slippery road, overspeed and dark time. Some of these accidents perhaps could have been avoided by better maintenance operations and by existence of lighting. The greatest reason to these accidents although could be found between the steering wheel and the driver's seat. The most accidents could have been avoided by the drivers maintaining the right situation speed.

The other very common accident types are the ones involving NMT (bicycle, moped and pedestrian), which form about 30 % of all accident types. This accident type is too common near the settled areas. People find their way too easy to the pavement, where fatal events easily occur.

Head-on collisions are the third biggest group of accidents forming one eighth of all accidents. Like in single accidents overspeed, slippery road and incorrect estimations of other road users' actions can easily lead to injury or death of one or several road user(s).

Over half of all accidents on the audited road had happened during the dark time. From fatal accidents the amount is the same, half of them happens during the dark. The accident amount was its greatest between Tartu and Elva, where two out of three accidents happened during dim and dark. Especially often a vulnerable (NMT) road user was a victim of the accident. Detailed accident locations are given in the chapter 5.2., where the recommendations for each section are also described.



Picture 4.2. Traffic volumes on Highway No. 3.

4.2.2. Black Spots

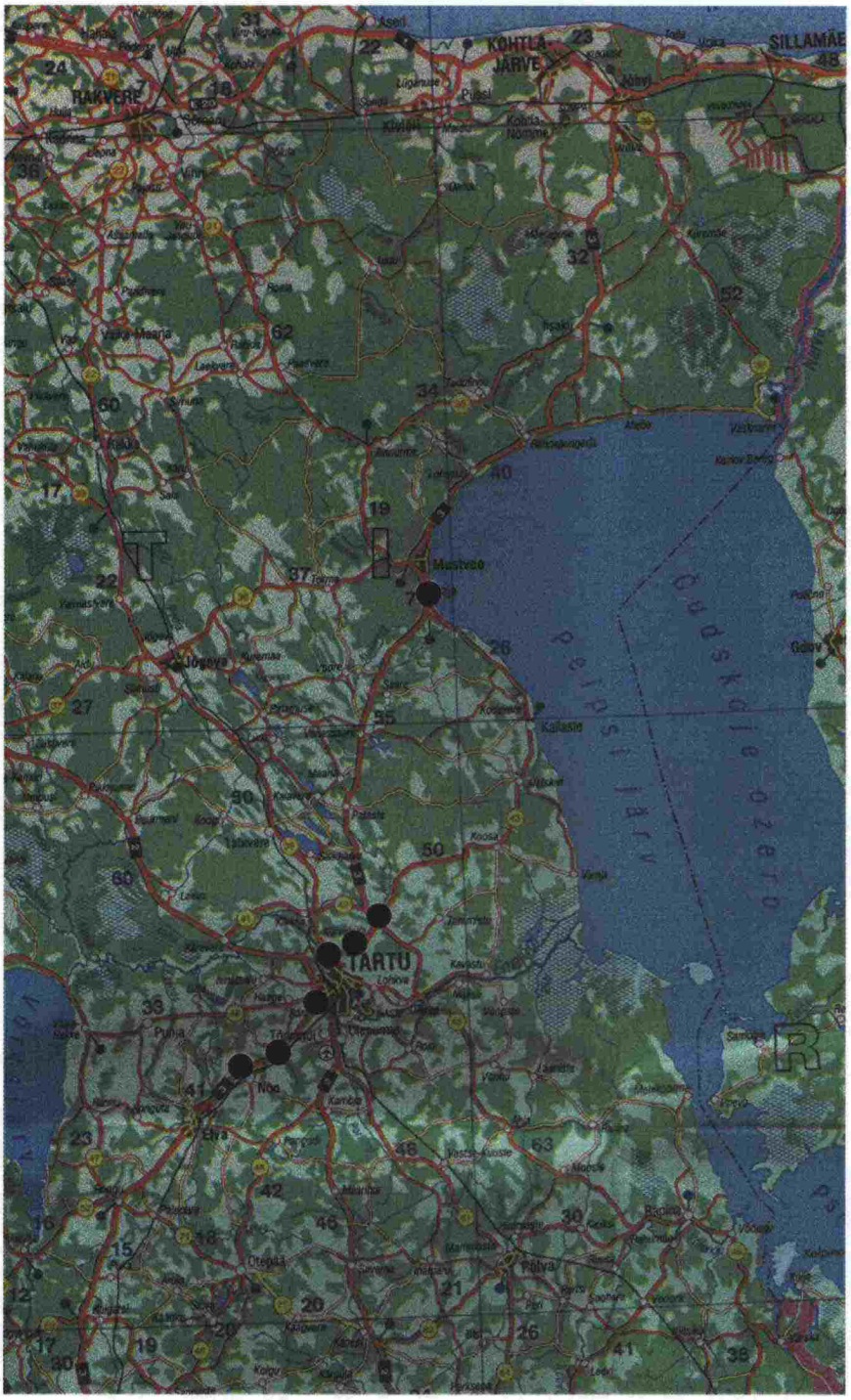
The audit team discussed about most hazardous spots on the road. These spots were further analysed by the authors of this report. More further the most dangerous of them were defined as "black spots" on the road. Black spot means short section of road where accident density or accident amount is high.

Black spots, in their kilometre order, are presented in table 4.3, and in picture 4.3. The definition of the black spots was taken place by the judgement of the auditing team. The speed at these spots is normally not limited despite of higher accident risk.

Location of the Black spots and their short definition:
- Raja-Kasepää; this section south of Mustvee suffers not only from local people, who gather along the road to sell their articles to the by-passers but also the driving off the road is common accident type on this section
- Aovere; the main intersection is not very visible, because it is situated on a hill in a curve, it has also several intersections located nearby
- Kõrveküla; several intersections located quite thinly
- Aru; location of two incoming roads to Tartu
- Räni; section nearest to Tartu, when moving towards Valga, wide cross-section and gravel shoulders, lot of NMT
- Külitse, very dangerous spot for pedestrians
- Nõo, land-use and intersections both sides of the road.

Table 4.3. Black spots on Highway 3.

Km at beg.	Km at end	Number of accidents (Killed/Injured)	Location and the main reason for accidents
75	81	11 (4/21)	Raja-Kasepää; running of the road, collision with the pedestrians
122	123	4 (0/7)	Aovere; running of the road
124	127	6 (0/11)	Kõrveküla, side collision (intersection)
127	130	4 (0/4)	Aru, running off the road
138	140	7 (1/9)	Räni, collision with bicycle or pedestrian
142	145	11 (3/10)	Külitse, collision with pedestrian
149	153	6 (0/9)	Nõo, head-on collision



Picture 4.3. Black spots of A8.

4.2.3. Other Hazardous Locations

The outside of the black spots reminded hazardous spots were simply defined as other hazardous locations. In some locations according to the accident history no accidents had happened. They were considered as other hazardous locations by the judgement of the AT. Some stretches, where accidents occurred relatively rare were also defined as other hazardous locations.

These spots are presented in table 4.4, as other dangerous spots. As to black spots, also typical to these spots are, that speed is not limited despite of the higher risk of accident.

- Tammetaguse-Iisaku; intersections quite densely
- Kauksi-Kalmakula, land-use both side of the road, Peipsijärv on the east side of the road, therefore lot of NMT crossing the road
- Mustvee intersection; unusual intersection type may cause confusion
- X-crossings on the Tartu by-pass; X-crossings seen more dangerous than other type of crossings, especially if a lot of straight moving traffic in the side direction exists
- Kalme intersection; too many intersections close to each other
- Kalme-Rõngu, section with the old pavement; lane markings worn out, no guide posts installed
- Rõngu built-up area; the state of NMT is too risky in a built-up area

Table 4.4. Other dangerous spots on the highway 3.

Km at beg.	Km at end	Number of accidents (Killed/Injured)	Location and the main reason for accidents
27	34	9 (5/10)	Tammetaguse-Iisaku, several accident types
45	64	10 (3/9)	Kauksi-Kalmaküla, running off the road, collision with pedestrian
72	73	-	Mustvee intersection
159	167	-	X-crossings on the Elva by-pass
166	167	-	Kalme intersection
167	171	5 (2/9)	Kalme-Rõngu, section with the old pavement
171	174	5 (1/8)	Rõngu built-up area

4.2.4. New Plans and Designs

In the year 2000 two parts of the highway 3 were finished; namely the part in Jõgeva county between km-stands (app. 92-101) and the by-pass of Elva between km-stands (app. 159-166)

For the year 2001 there are some plans to be carried out. According to the information that was given to AT two actions on the audited road will start. In Kalmaküla (situated north of Tartu) lighting and a pedestrian way will be constructed from the highway 3 northwards on the local road. The section with old pavement between Kalme and Rõngu (km-stand 165,8 – 171,5) will be repaved. Similarly the equipment of the road (signs and posts) will be modernised. Outside the audited section in Valga county after Tartu county new construction site will be erected (km-stand 177,0 – 217,1).

5 FIELD INVESTIGATIONS AND RECOMMENDATIONS FOR SAFETY IMPROVEMENTS

The identified defects in road safety and proposed remedies are explained with drawings and photos as a part of the study. Some ideas for improving the road conditions are explained as drawings as well.

The detailed plans and designs to improve traffic safety are to be made in the next stage. The audit has identified and put forward the ideas and innovations for improving the traffic safety.

5.1. General Findings in the Field

The audit of the Highway No 3 was performed on the December 12th and 13th in 2000. The audit team included Mr. Ismo Heikkinen of Finnra consulting and Mr. Margus Nigol of IB Stratum and Mr. Reigo Ude of ERA. The part between Tartu and Rõngu was checked also during dark time on 12th December. The new road Elva-Kalme (new markings and guide posts) was the only part clearly visible. On other parts of the road the edges were rather unclear due to worn carriageway markings. Rainy weather and the headlights of oncoming cars weakened the visibility even more.

The whole highway no 3 was two lane road at its governmental parts. Some parts in Jõhvi and Tartu were four lane streets. Their responsibility belongs to the municipalities themselves. The traffic density was largest near the city of Tartu, where the accident amounts are also highest. Some variations in the road structure and equipment were between the different counties along the road. For example no km-markings were used in Ida-Virumaa and the shoulders were wider in Tartu county.

A proper camber is missing from some parts while the last repavement was done with the surface treatment. When using surface treatment, it should be notified, that at least 2 % fall from the centre to the edges should be secured, because the longitudinal gradient is mostly very flat. This would allow the surface water to run off the pavement.

From the road shoulders the markings partly missing (in Jõgeva and Tartu counties from the old parts). In Jõgeva county only the central line was painted. In Tartu the markings were mostly worn out and the centre line represented the marking best survived. Proper roadside marking could prevent some accidents. Markings should be reflective, which in turn would improve the visibility of the road edge.

The lighting of the road is also inadequate. The road sections where lighting is most urgently needed are in urban and village areas as well as at important intersections.

Bridges and culverts were in some places narrower than the road. The bridges should be wider in accordance with the cross-section of the road.

The NMT-network was incapable. Separate pedestrian ways existed only in town areas and in Iisaku and Rõngu. Also the bicyclist should be allowed to use pedestrian/bicycle way. Therefore the width of the separate NMT-lane should be at least 2,5 metres. In order to improve the conditions for NMT, a separate NMT-lane, adequate shoulders or other arrangements should be constructed along the whole road.

In Tartu county both Elva by-pass and the built-up area part in Rõngu were constructed or re-constructed lately. Both new solutions seemed to miss the last traffic safety knowledge, especially, when concerning the junctions. In order to prevent casualties in junctions and to minimise the risk of an accident, all X-crossings along the Elva by-pass would have been constructed to interchanges (multigraded junctions) or staggered junctions (X-crossing forming two T-type junctions). In built-up areas (like Rõngu) a roundabout type should have been considered when replacing an X-crossing (e.g. in the centre of Rõngu).

5.2. General recommendations

Highway 3 is one of the major north-south connections in Estonia. The road should also have common standard despite of different counties. This should be notified, when developing the road. This notification applies especially to road equipment, markings, signs and guidance. The intersection types and intersection density should be also of the same kind. The width and the cross-section of the road could be constructed on relation of traffic amount. Similar standard of the road gives a safer feeling to the driver and prevents confusion situations along the road.

5.2.1. Alignment and cross-section

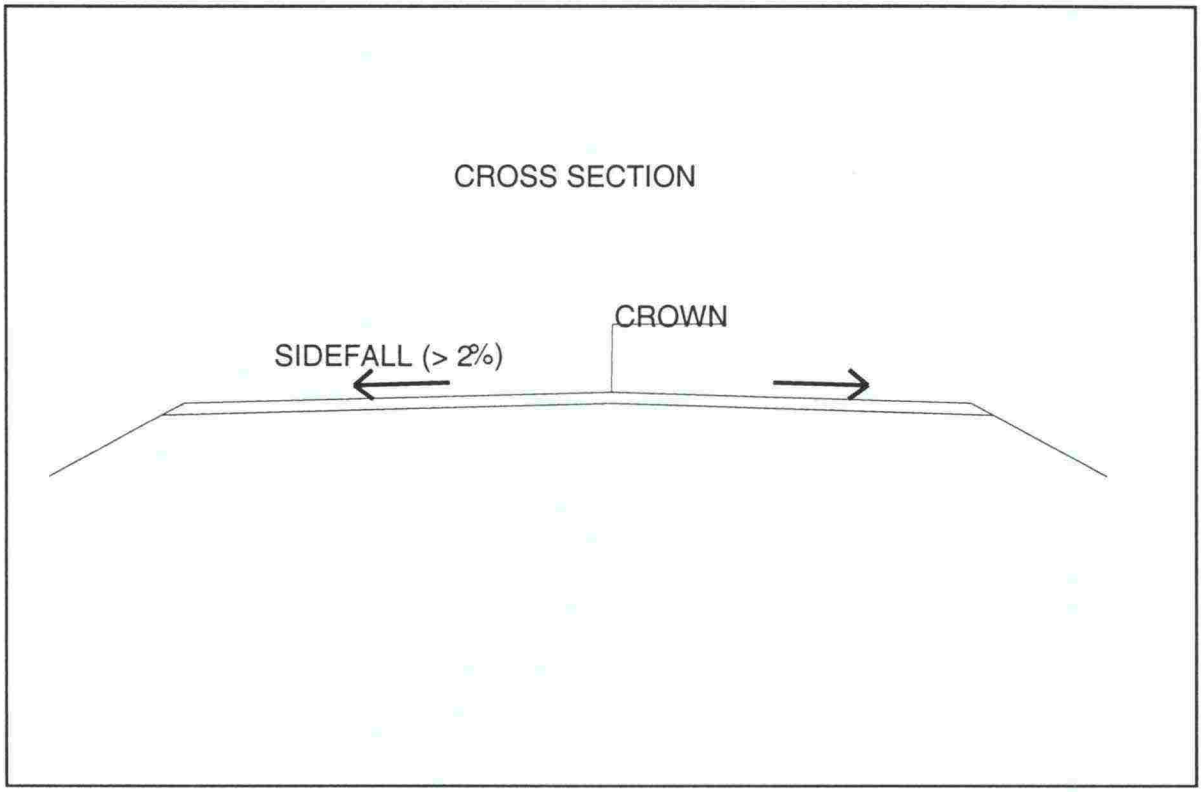
Some parts of the road are bendier than the others. Good examples are the sections from Iisaku to Mustvee and from Kalme to Rõngu. The road is hilliest in Jõgeva county between the km-stand 80 ...100.

Normal width of the road is 7...8 metres between the side-markings. The shoulder width varies very much, almost from zero to 4 metres. The shoulders are widest both sides of Tartu, where they mainly are surfaced with gravel.

Almost along the whole route there is a need for wider asphalt shoulder. The road is used very common with bicycles and pedestrians. This is especially common near the settled areas. In order to improve traffic safety of slow and light traffic, an asphalt shoulder with minimum width of 1 metre should be constructed to prevent the collisions between motor vehicles and NMT. Similarly the shoulder should include a wider gravel part. The importance of a paved shoulder is more important there where separate pedestrian lanes don't exist. Paved shoulders also serve the slower motorised traffic such as tractors and other agricultural machines.

In many cases the sloping position of the pavement is too slight. This is most common, where the last surface is from surface treatment. In these sections the road has no proper crown. This leads easily to poor drainage of the pavement surface as water stays on the road and causes dangerous situations to the road users. In order to help the drainage operations the vegetation control beside the road should be performed regularly and adequate widely. During wintertime inadequate sloping position can lead to slippery road surface while the surface freezes e.g. during nights. An example of proper cross-section is presented in the picture 5.1.

When old pavement occurred, in some cases the edge of the pavement and gravel shoulder was too steep and too raggered. This is one reason, why NMT uses the carriageway.



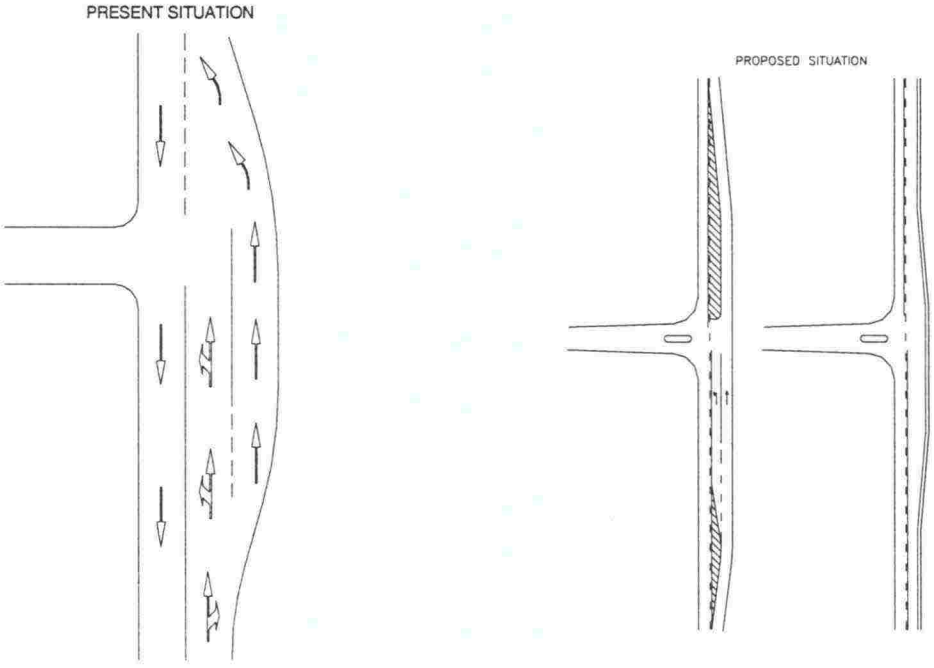
Picture 5.1. Exemplar scheme of the cross section of the road.

5.2.2. Intersections

The condition of the intersections and lane arrangements varies quite much. Only some of the intersections had lighting.

The secondary crossroads are usually unpaved which causes that fine aggregates to spread to the main road. Secondary crossroads should be paved with the short section.

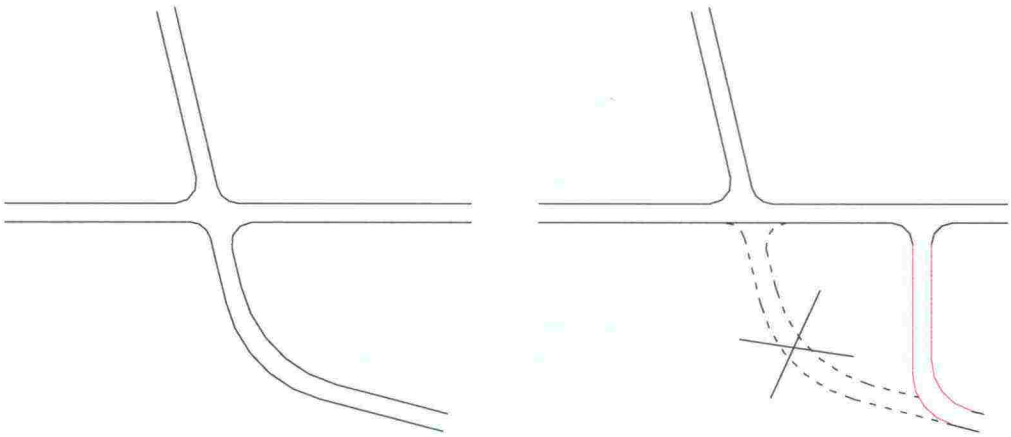
The road markings (arrows), which determine the turning lanes, are not marked according to the European standards. In the same lane, the first arrow may point to right, and the next arrow may point to left (see picture 5.2). Also, nearer the intersection, it is forbidden to change the lane (e.g. from left turning/straight moving lane to right/straight moving lane) according to the road markings. In our opinion, this may cause confusion. These markings were most common in Tartu county on the section with old pavement. AT suggests they should be re-marked gradually with left turning lane marking or by-pass zone according to the picture 5.2.



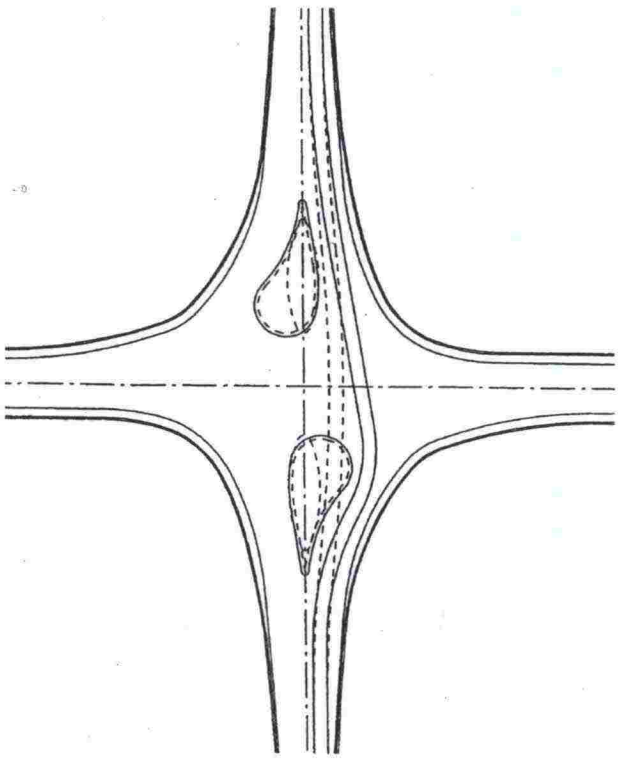
Picture 5.2. Turning lanes, present and proposed situation (either separate turning lane or by-pass zone).

Along the road there were some X-crossings. This concerned the new road section on Elva by-pass as well. The hazardous X-crossings should be moved into staggered junction (two T-crossings) (see picture 5.3.) or to be equipped with "safety islands" as explained in the picture 5.4. In safety islands the central island is formed in a shape of drop, which prevents the fast approaching from the side road.

The X-crossings could be replaced also with a roundabout. The roundabout is normally used inside the built-up areas and spots, where the main traffic flow is not in the main road direction. AT sees that suitable spots for roundabout are on highway 3 in Mustvee and Rõngu. The roundabout after Tartu on the crossing of highways 2 and 3 was in order.

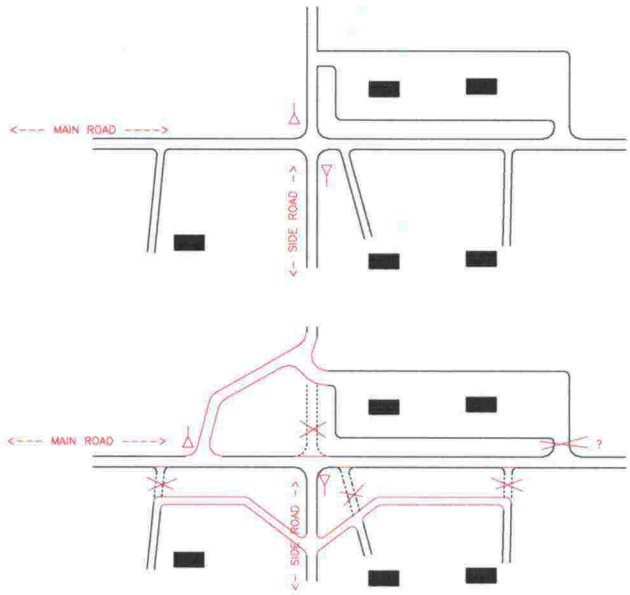


Picture 5.3. An example of a staggered junction.



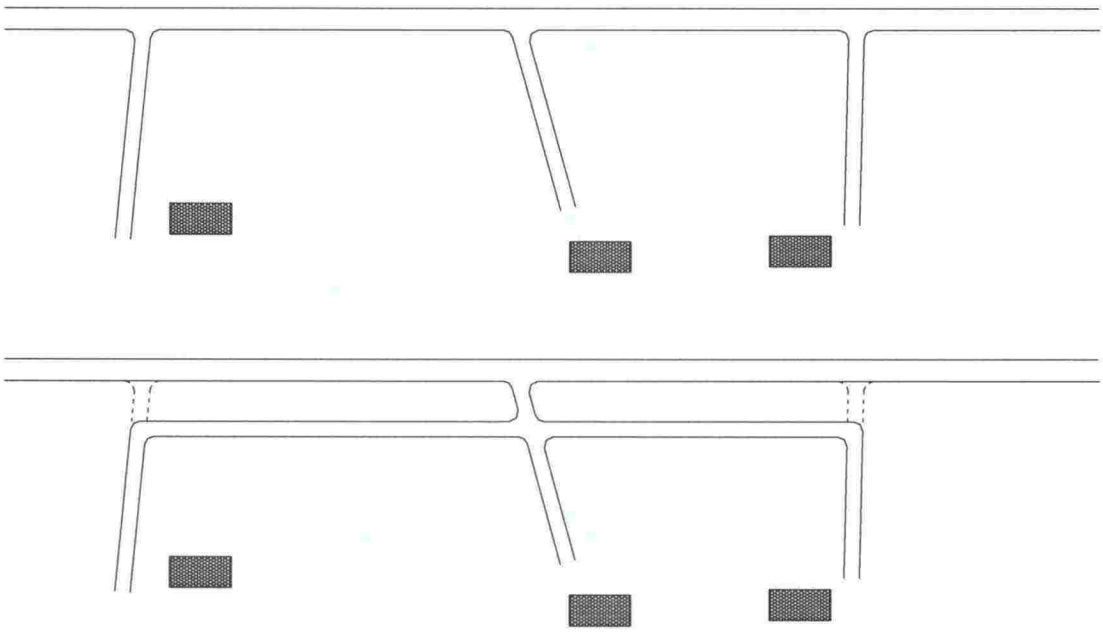
Picture 5.4. An example of intersection with "safety islands".

Some of the X- and T-crossings had also yard and municipality accesses near the crossing. AT suggests to reorder the minor crossings from the main road to side road. Other possibility is to move these accesses on the main road, but far enough from the main crossing. The rearrangements for the main intersection could be done similarly. An example of this possibility is specified in the picture 5.5.



Picture 5.5. An example of intersection arrangements.

Especially before and after Tartu there were lot of yard and other minor accesses to the highway. In order to reduce conflict possibilities minor accesses should be reorganised to form one larger access as defined in the picture 5.6. This access could also be equipped with central island (on the side road) or with lane arrangements on the main road (see picture 5.2.).



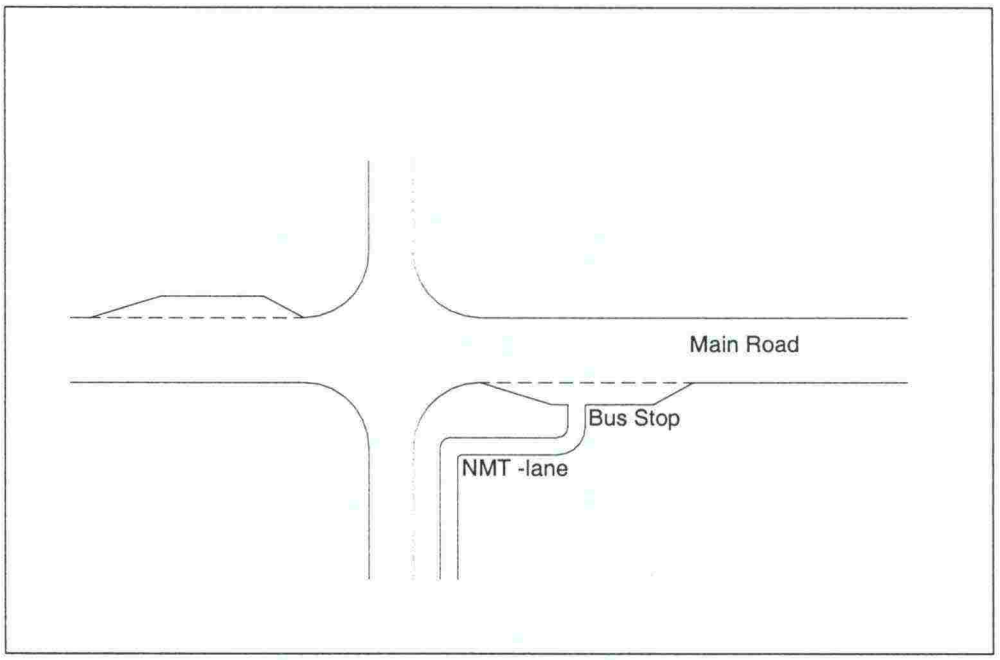
Picture 5.6. Rearrangements of minor (farm and yard) accesses.

5.2.3. Transport modes and land use

Near towns and villages there is a need for a separate NMT-lane. Pedestrians and bicyclists use the shoulders, but when condition of the shoulder is poor they find their way to the pavement. This may cause conflicts between motorised traffic and NMT. In order to protect the shoulder users lighting should be installed inside and near built-up areas. Erection of the lighting should depend on traffic flow and the amount of NMT. Also a reduced speed limit for main road should be considered where lot of pedestrian traffic and NMT-crossings exist.

The width of the pedestrian way or lane must be sufficient wide for incidence of a pedestrian and a bicycle. In our opinion the width of the lane should be at least 2.5 metres.

The bus stops were not always properly situated. They should normally be situated after the intersection. Waiting areas are normally large enough, but in many cases there is a lack of proper routing preventing the pedestrian from safely reaching the bus stop (see picture 5.7).



Picture 5.7. Schematic illustrations of the bus stop arrangements in the intersection area.

There are too few parking and resting possibilities beside the road. To prevent false parking along the road these possibilities should be developed. This should specially be notified near the recreation areas of lake Peipsijärv.

5.3.4. Driving

The attitude of the road user is one of the most important elements, which affects the accident rate. The road user should be aware of the fact, that there are risks when driving in traffic. Large amount of accident types running off the road and turnover as well as head-on collisions means normally that the drivers' attitude or education is not right. On the other hand high risk of death among the NMT-users means normally the same. When examining driver's attitude, quite normally overspeeding and overtaking is connected to high accident risk. If a road user is aware of the risks, he or she follows enough carefulness all the time when moving and avoids the conflicts by using speed correctly.

Especially following risks should be conscious of on the highway 3:

For pedestrians and cyclists:

- The crossing of the road is always dangerous and should be take place, where visibility is good enough. Among the road administrator's decisions one should always observe old people, children and all other road users, who have difficulties to move with the traffic.
- Moving along the pavement can be dangerous especially in the dark and in winter conditions.
- Moving along the edge of the pavement or gravel shoulder can be dangerous.
- Due to potholes and edge breaks, the fall of the cyclist is easy.
- In the dim and dark, pedestrians and cyclists must always use proper reflectors.
- Use of other safety items (e.g. bicyclist's helmet) can prevent fatal or bad injury.

For car users:

- The alignment of many sections on highway 3 persuades the driver to overspeed.
- The collision with a tree, post, house or road barrier could be fatal.
- Special consideration should be given to pedestrians and bicyclists that are moving on the shoulder of the road.
- Special consideration must be given to traffic safety in the town and village areas, where there are many intersections, pedestrians and bicyclists.

The average speed (in reality) normally exceeds the speed limit (at least during the summer). If the speed limit is 90 km/h, it is usual to drive 100...110 km/h.

In the built-up areas like in Iisaku or Rõngu the speed limit (40...50 km/h) is not notified. This is due to the good alignment and wide cross-section of the road, which encourages the driver to overspeed.

One other issue that could sometimes have an influence on traffic safety is legislation. According to our knowledge the bicyclists should actually drive on the carriageway side. If the bicyclists follow the law, it can lead easily to fatal events. This error in the legislation should be removed immediately. Bicyclist is in safer place among the pedestrians than other motor vehicles while collision of bicyclist and motor vehicle is more generally fatal than collision of two cyclists or cyclist and pedestrian.

5.3.7. Maintenance and road works

Maintenance should be effective on the shoulders and NMT-lanes especially during wintertime, when the pedestrians find easily their way to the carriageway.

Where the lighting is installed, proper control of damaged lamps should be organised in order to prevent accidents.

5.3.8. Traffic control

Road signs seemed to be basically in a good shape. They were also quite clear. In some cases, there were some old signs, which didn't have any reflective material on them. Old signs should be replaced with new ones.

5.3.9. Road devices and special structures

Some bridges or culverts especially near lake Peipsijärv were too narrow for the road cross-section and should therefore be widened.

Very few parts of the road were lighted. According to the accident history many accidents appear during the dark time. Because of the poor markings at the road edges, poor shoulder condition and lack of the separate NMT-lanes, the NMT find their way to the pavement, where the motor vehicles collide on them. The consequences are mostly dramatic in these situations.

In some cases the houses were too close to the road. Normally these road parts were equipped with road barriers made of steel. On a long run, these houses should be eliminated from the road area permanently.

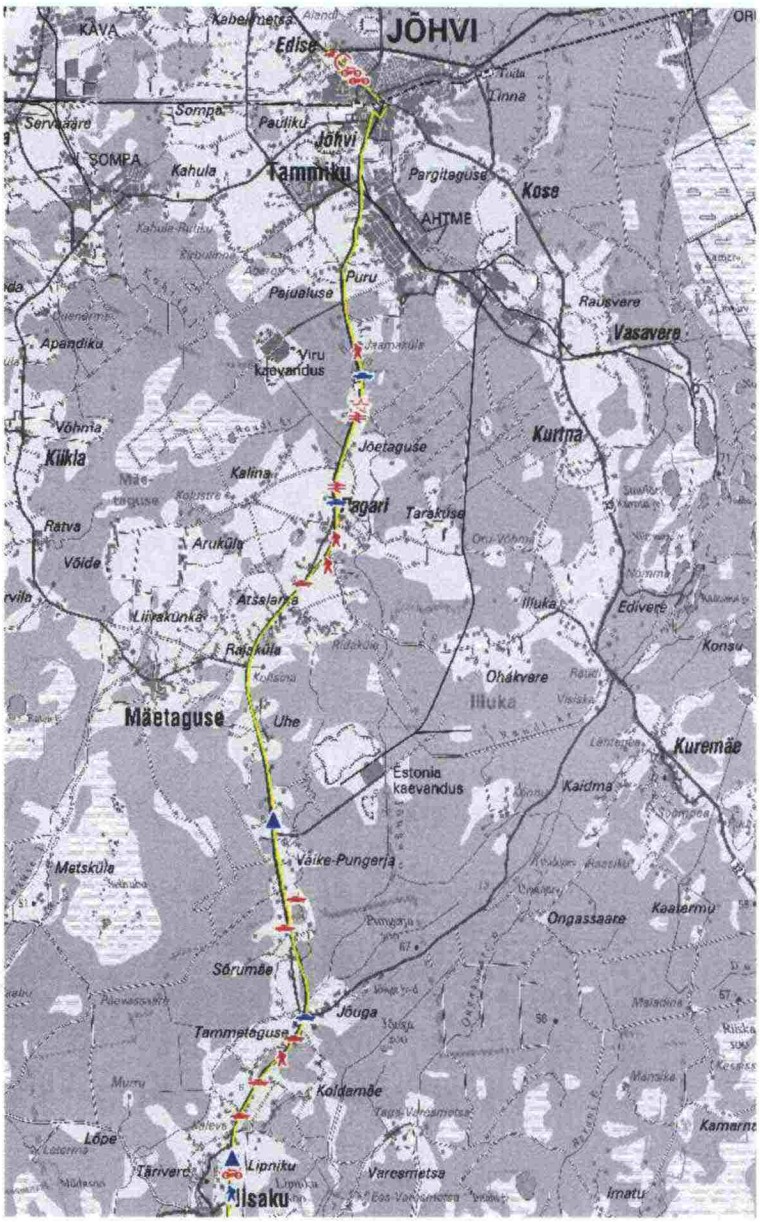
There were only some resting areas on the road. It would be necessary to build more resting areas along the road. They should be situated in attractive places so that they are inviting for road users to stop and rest. Especially near the shoreline of lake Peipsijärv more resting areas should be founded.

Almost the whole road was equipped with guide posts. The distance although varied sometimes a lot. According to our knowledge this is changing, and the gap distance between two posts has changed from 100 to 50 metres. The actions should slowly follow this, which AT understood, was also happening.

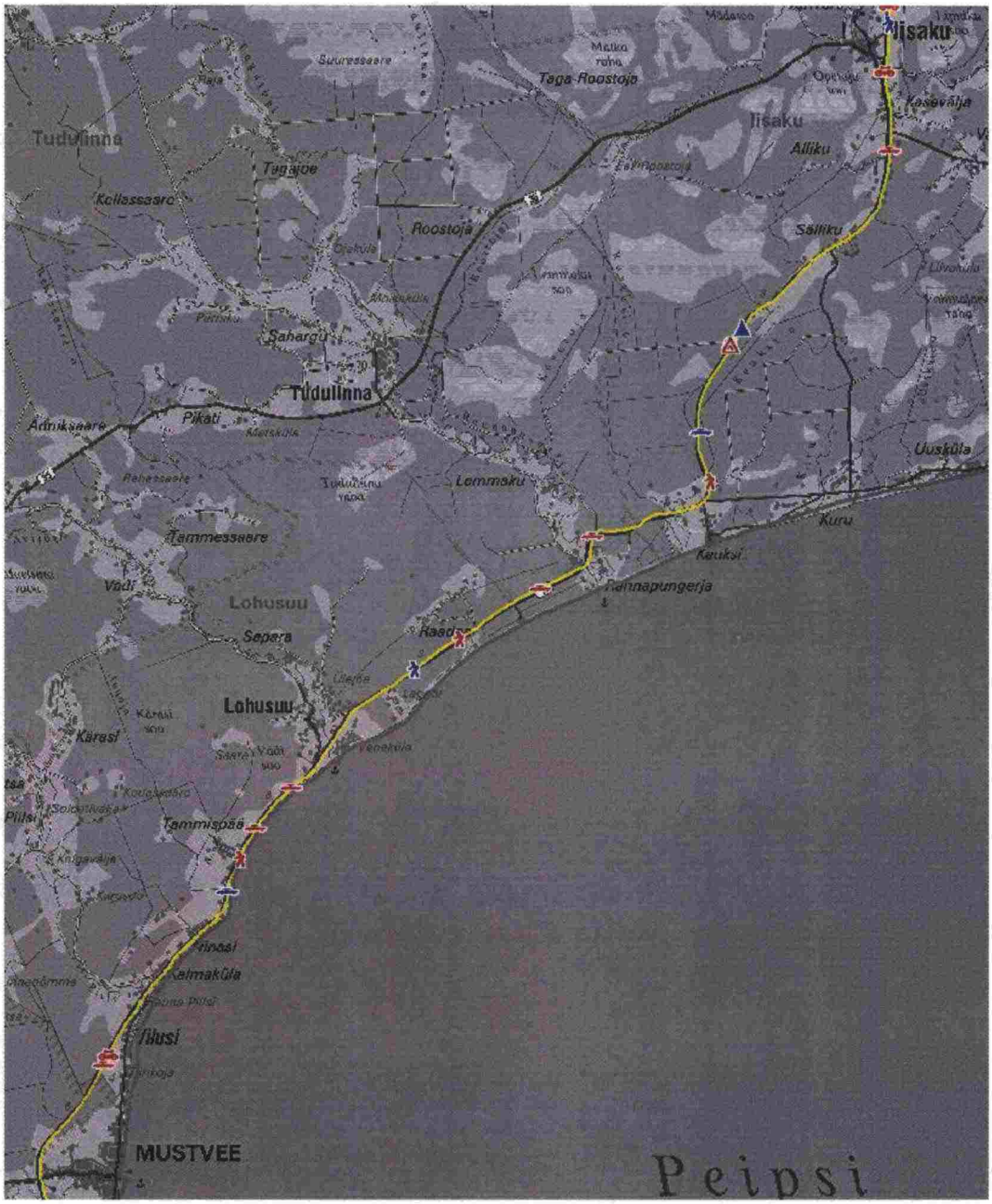
5.3. Detailed recommendations

The following chapters point out detailed recommendations for traffic safety improvements, with kilometre readings of the most hazardous road sections. Partly the km-stands are estimated. Special concentration is given to locations/spots, which were considered the most hazardous places during the field studies. Among the detailed recommendations a detailed map with its accident locations are presented.

5.3.1. Section: Jõhvi - Mustvee (km 0– 73)



Picture 5.8. Accident locations between Jõhvi and Iisaku.



Picture 5.9. Accident locations between Iisaku and Mustvee.

The traffic volume of this long section is highest near Jõhvi with 2400 vpd. Between Iisaku and Kauksi the traffic volume is lowest along the whole audited section about 900 vpd. The alignment is fairly straight at the beginning part. After Iisaku more curves seem to appear. The curves relate probably on the several overturns on this part.

On the beginning part of the road there are two railway crossings leading to "burning stone" mines. Only the other crossing is somehow warned. If the railway crossing is needed it should be developed with sufficient warning system or solved with some other possibilities.

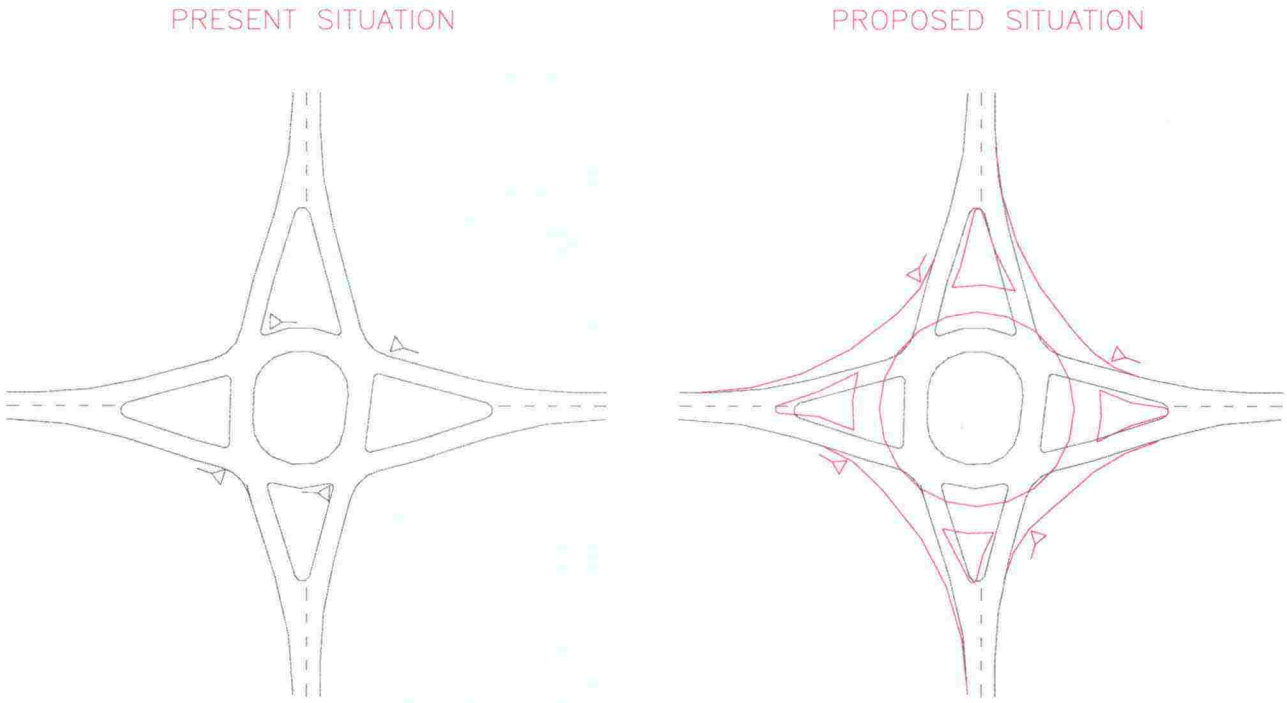
Picture 5.10. Beginning part of the highway no 3 in Jõhvi.

On the section from Kauksi to Mustvee there is land use both sides if the road, when little villages exist all the time. There is only one resting area although the whole area is quite popular especially on holidays. This section is also quite windy, most of the accidents types are "running off the road" or collisions on vulnerable road users. Only the part between Ninasi and Vilusi near Mustvee has speed limit. No accidents have happened on the speed limited part. The part from Kauksi to Mustvee (along the lake Peipsijärv) needs reorganisation of the minor accesses, wider shoulders or separate NMT-lanes for pedestrians and a few resting areas. Also the pedestrians' crossovers should be directed to safe locations. It should be considered whether speed limit could be limited on the most built-up areas of this section. Later the construction works should follow to change the road environment to such that the road users would follow the speed limits automatically.

Lake Peipsijärv can have influence on road surface conditions, when it keeps the temperature milder during summers and winters. It can easily create foggy and slippery situations during the colder part of the year. This should be observed when renewing the maintenance routines. Because of the changing weather conditions along the section near lake Peipsijärv, could this part of the road be ideal, when testing winter maintenance routines or variable road sign systems, if they are developed in Estonia.

The section ends to Mustvee crossing (see picture 5.11). The intersection type is quite exceptional from the normal crossing types, although this type of crossing is seen safer than normal X-crossing. The AT suggests to replace the crossing with large roundabout in order to prevent high speeds on the priority way. Roundabout type intersection as presented in the picture 5.12. is more common and much more systematic for all road users to understand. In AT´s opinion this type would prevent also stops in the intersection area, which AT saw during the auditing.

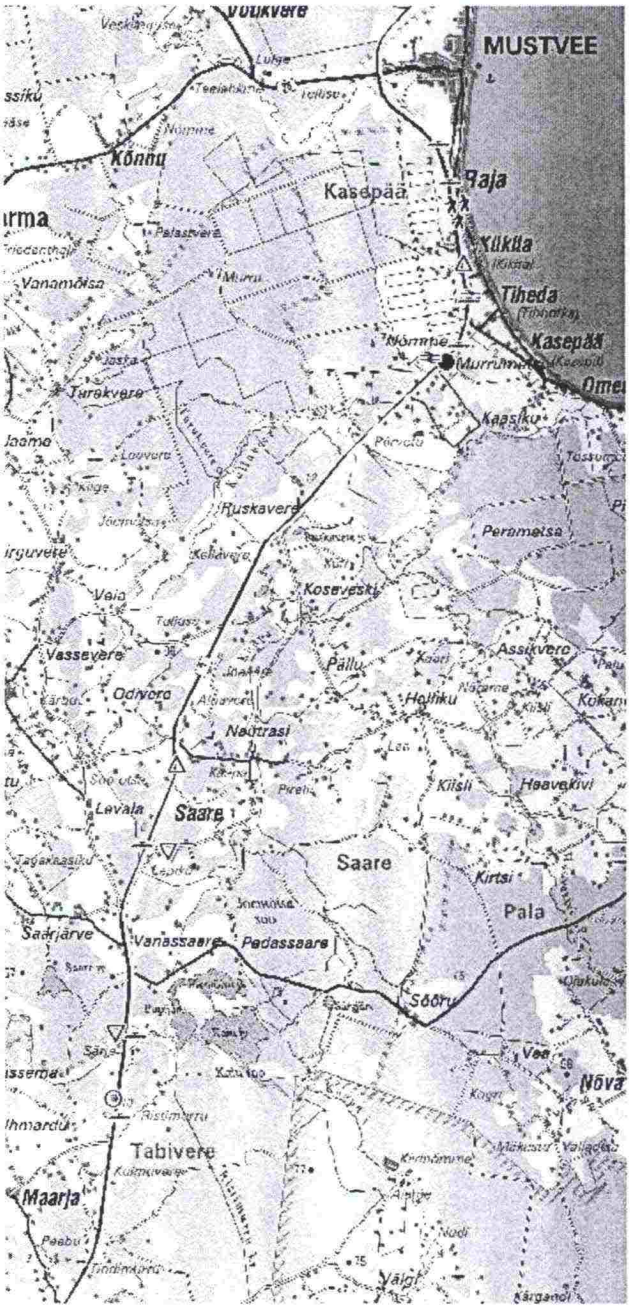
Picture 5.11. Mustvee crossing, picture taken from south.



Picture 5.12. Mustvee crossing, present and proposed situation.

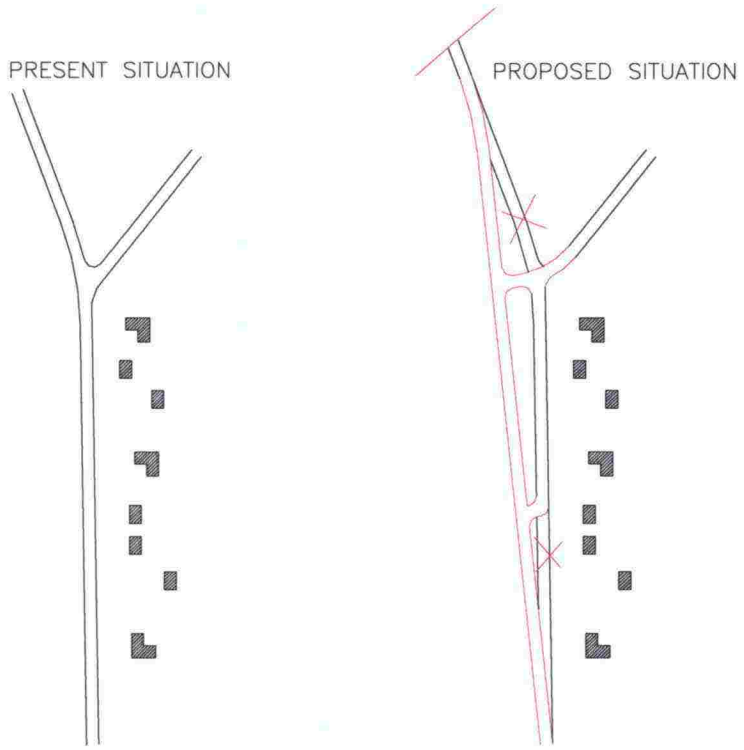
5.3.2. Section Mustvee - Igavere (km 73–111)

Problems of this section focus on the first kilometres of the section between Mustvee and Kasepää. Running off the road and pedestrian accidents are common on this section. The road is straight along this section, which easily persuade the drivers to overspeed. Some of the running offs relate definitely on slippery or foggy road conditions.



Picture 5.13. Accident locations between Mustvee and Igavere.

Pedestrian accidents relate on the part of village Raja, where local people gather along the road to sell their articles to the passers-by. AT sees the best way to get the situation improved is to build a separate place for all sellers on the eastern side of the road. When constructing the separate sellers'/resting area, old road can be used to this purpose. This idea is presented in the picture 5.14. The realisation of this idea would need the co-operation of the local sellers. After construction of the separate selling/resting area the selling along the road would be prohibited as well as the parking of the vehicles beside the road. The selling area should be dimensioned for both all sellers and parking vehicles.



Picture 5.14. Selling place south of Mustvee intersection.

After the straight part of the road beside village Raja there is an intersection for Kasepää. This intersection has no lane arrangements. Kallaste and Mustvee are reasonable large towns in the lake Peipsijärv area. Therefore it is assumed, there are enough traffic for implement the lane arrangements. This is also, what AT suggests.

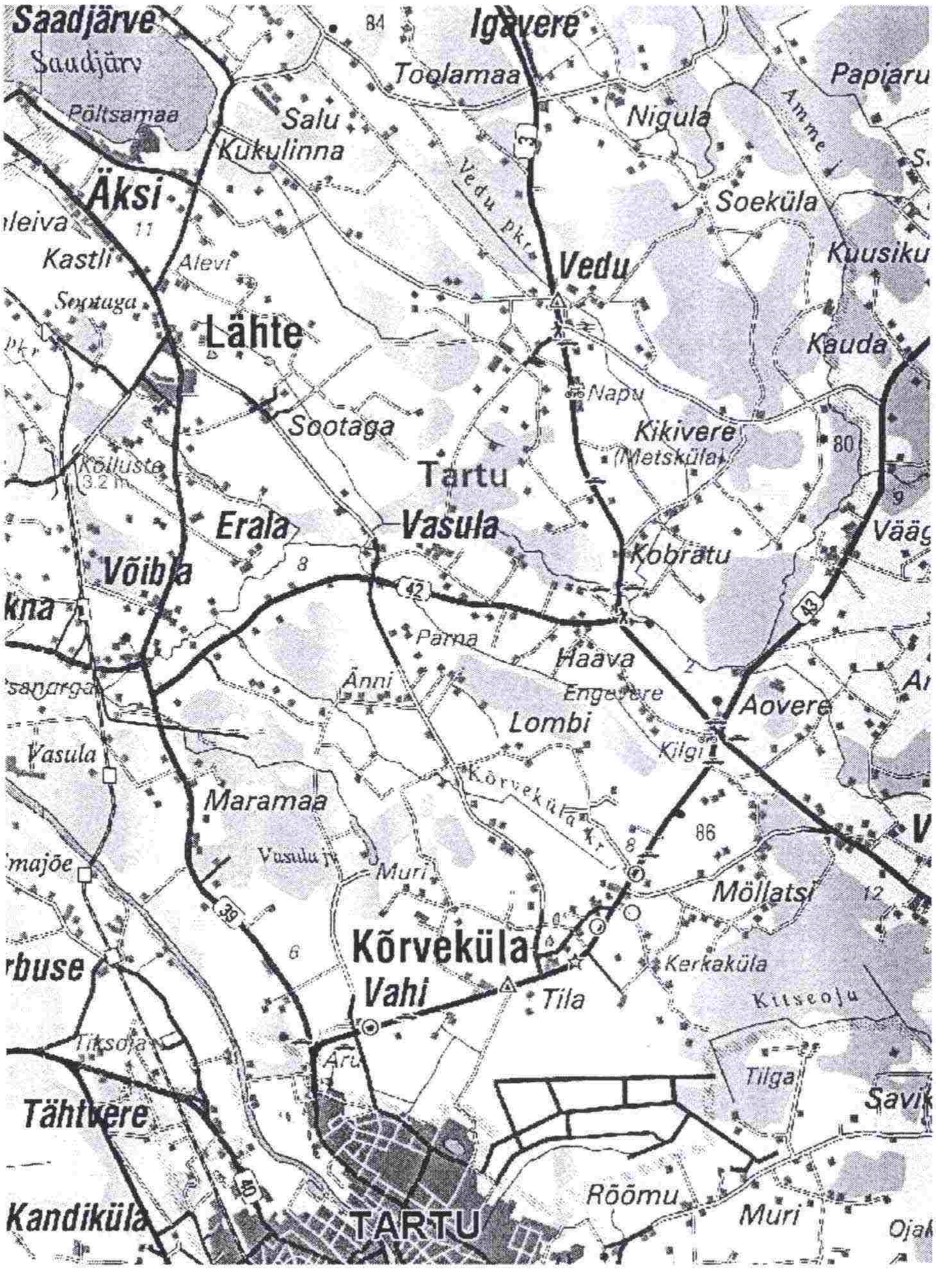
After Kasepää intersection begins an emergency runaway. Usual to such runaways situated on the highways is that single accidents easily occur. The reason to this is usually overspeeding due to excellent alignment and visibility. The asphalt surface is quite narrow for the runaway. The widening of the road asphalt shoulders could prevent some accidents happen. AT sees, this should be considered.

Picture 5.15. Reconstructed section between Mustvee and Tartu in Jõgeva county.

After runaway is the hilliest section on the road. The surface is quite uneven and crossfall of the road varies much. No accidents have although happen before Saare. Speed limit is set to 70 km/h for trucks only. This usually encourages the cars to overtake trucks, which is not good, while the road is quite hilly. AT suggests to resurface the pavement and make the slopes more gentle for both the surface and the road border/bankment. Other way to ensure traffic safety in the case of running off the road, is to erect road barriers. After renovation of this part it should be considered if the speed limit of the trucks could be raised on the same level with other cars.

Several accidents locate also between the km-stand 91-101, which was reconstructed in year 2001. Some minor actions surprise, like the different shoulder width on the right and left side of the road. The most important intersections have now lane arrangementsl. AT sees the renovation of the road is successful, especially when thinking that the traffic volume is only about 1000 vpd on this section.

5.3.3. Section Igavere - Tartu (km 111–130)



Picture 5.16. Accident locations between Igaver and Tartu.

Accidents exist quite densely on the section in Tartu county from Vedu to the point, where minicipality's responsibility begins. The proper camber as well as sufficient road markings fail from the road. The road itself has a wide cross-section, although the shoulders are from gravel.

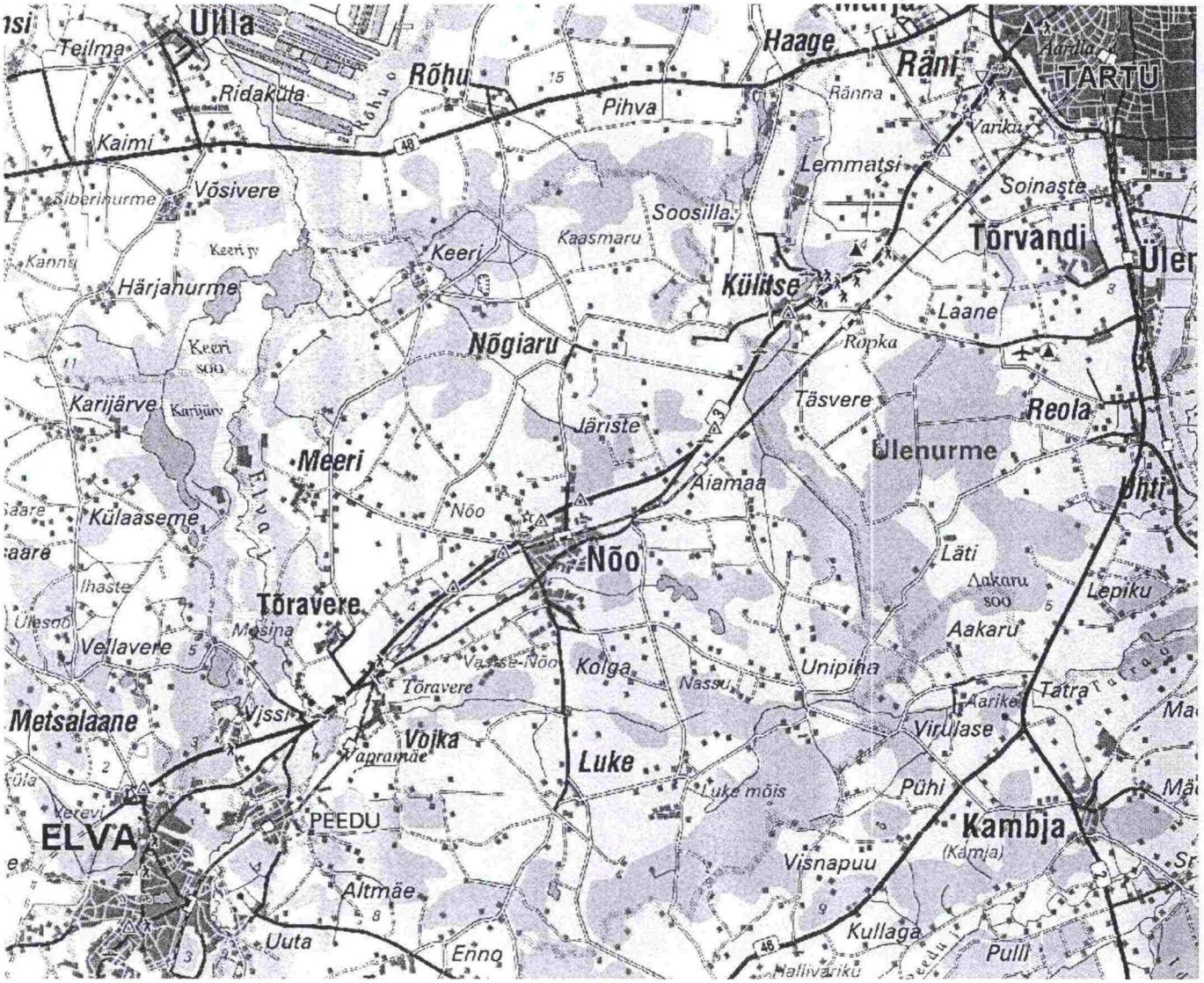
Some pedestrian/bicycle accidents as well as running off the road- accidents occur between Vedu and Aovere. Between Aovere and Aru the accident types are different. Better markings, proper lighting and intersection arrangements would improve traffic safety of the car traffic. In a long run separate NMT-lane would be needed between Tartu and Aovere. Widening of the road could be sufficient enough north of Aovere. The lighting would improve the optical guidance as well, which is insufficient e.g. in the intersection in Aovere situated in a curve (see picture 5.17.)

Picture 5.17. Aovere intersection.

5.3.4. Section Tartu - Elva (km 138–159)

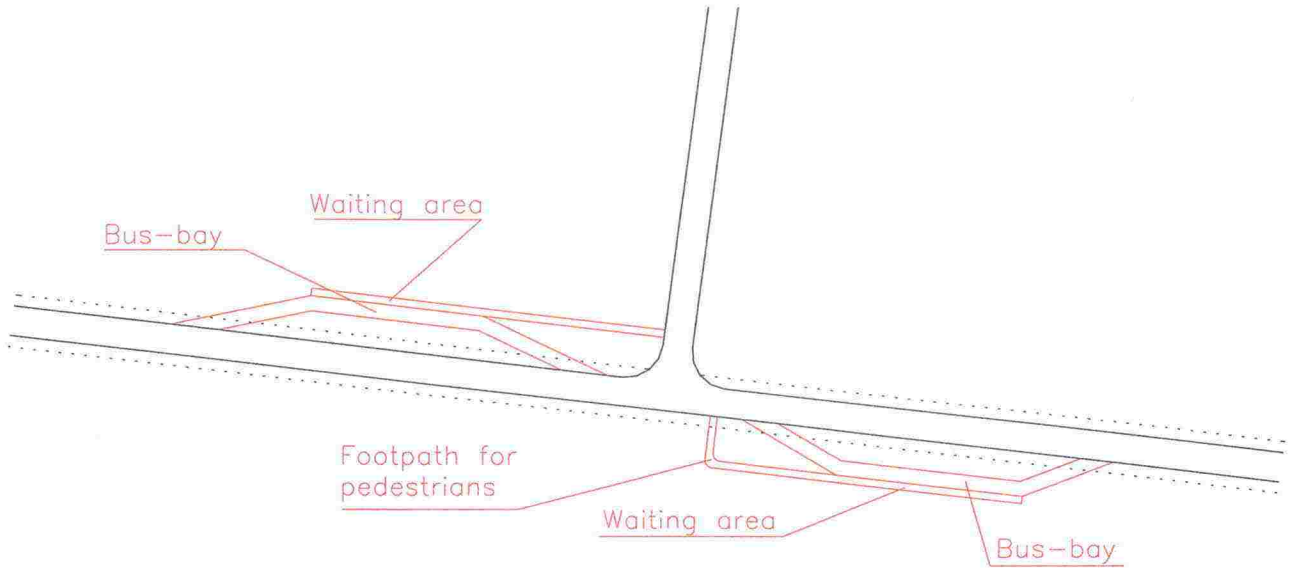
The section after Tartu towards Elva is the section that needs perhaps most urgent some actions. The most dangerous short spots along the road are situated along this section. The problems situate especially in three different points; Räni, Külitse and Nõo. As a first aid to prevent more accidents to happen, all three spots would need lower speed limit. Setting the speed limit lower wouldn't radically change the behaviour of the road user, but with this action more time could be obtained for solving the problems. All the three points near urban settlements need also reorganisations of junctions and accesses.

AT sees at least in Räni and Külitse the most serious problem is the one related to the pedestrian and bicycle traffic.



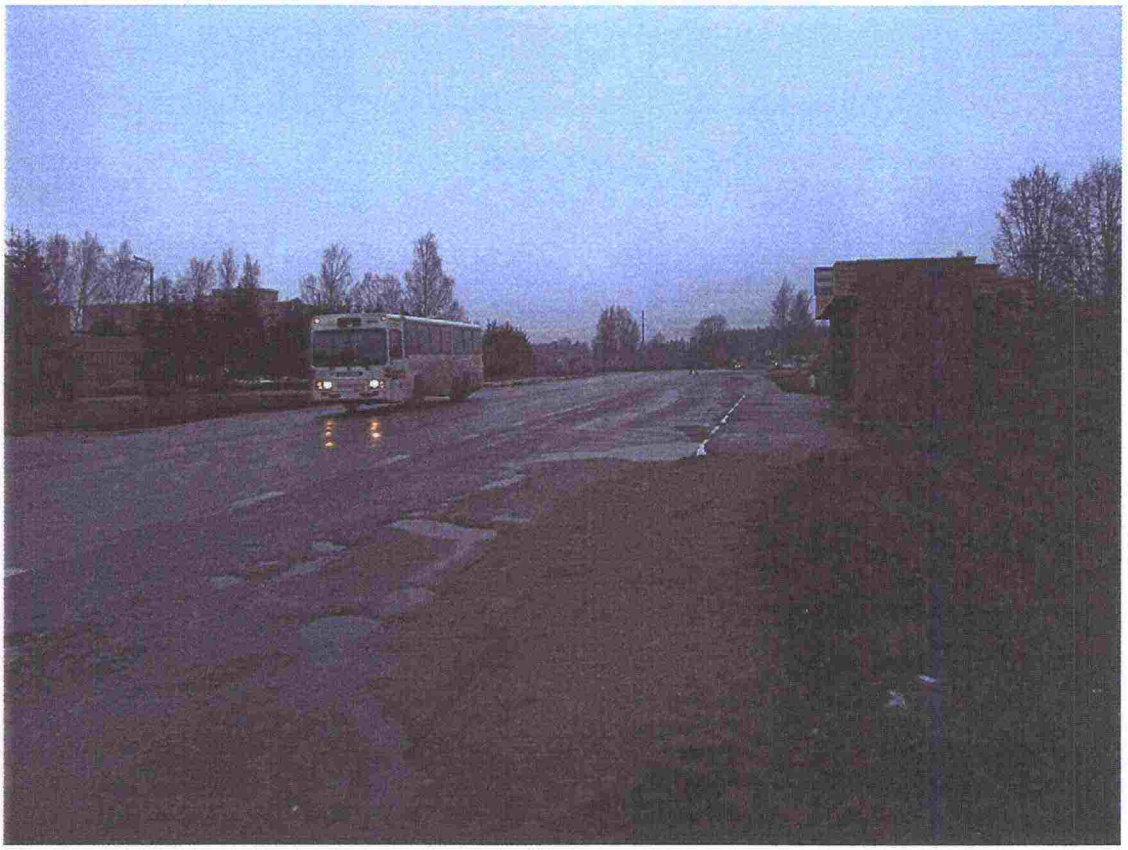
Picture 5.18. Accident locations between Tartu and Elva.

In a long run a separate pedestrian way all the way to the Nõo would be needed, when improving the status of non-motorised road users. Some accidents are related to the bus traffic., when the NMT has overcrossed the carriageway. The best way to get rid of such accidents is to construct an underpassage for the NMT: AT sees that because of flat landscape the underpassage would not be a perfect solution in Külitse. It is too easy to cross the road from the bus stop direct. Therefore proper bus-bays (see picture 5.19) with some transition from the carriageway are needed at least in Külitse. The purpose of separate bus-bay outside the road would affect so that the NMT couldn't rush then direct across the road. These bus-bays both sides of the road could be constructed immediately.



Picture 5.19. Bus-bays proposed to Külitse.

In Nõo the head-on collisions form the accident type most common. AT suggests to consider the overtaking forbiddance between the km-stand 149,5-151 to location, where the major intersections on both sides exist. The lane arrangements chould be cleare and to be performed according to the principles in the pictures 5.2.-5.6.



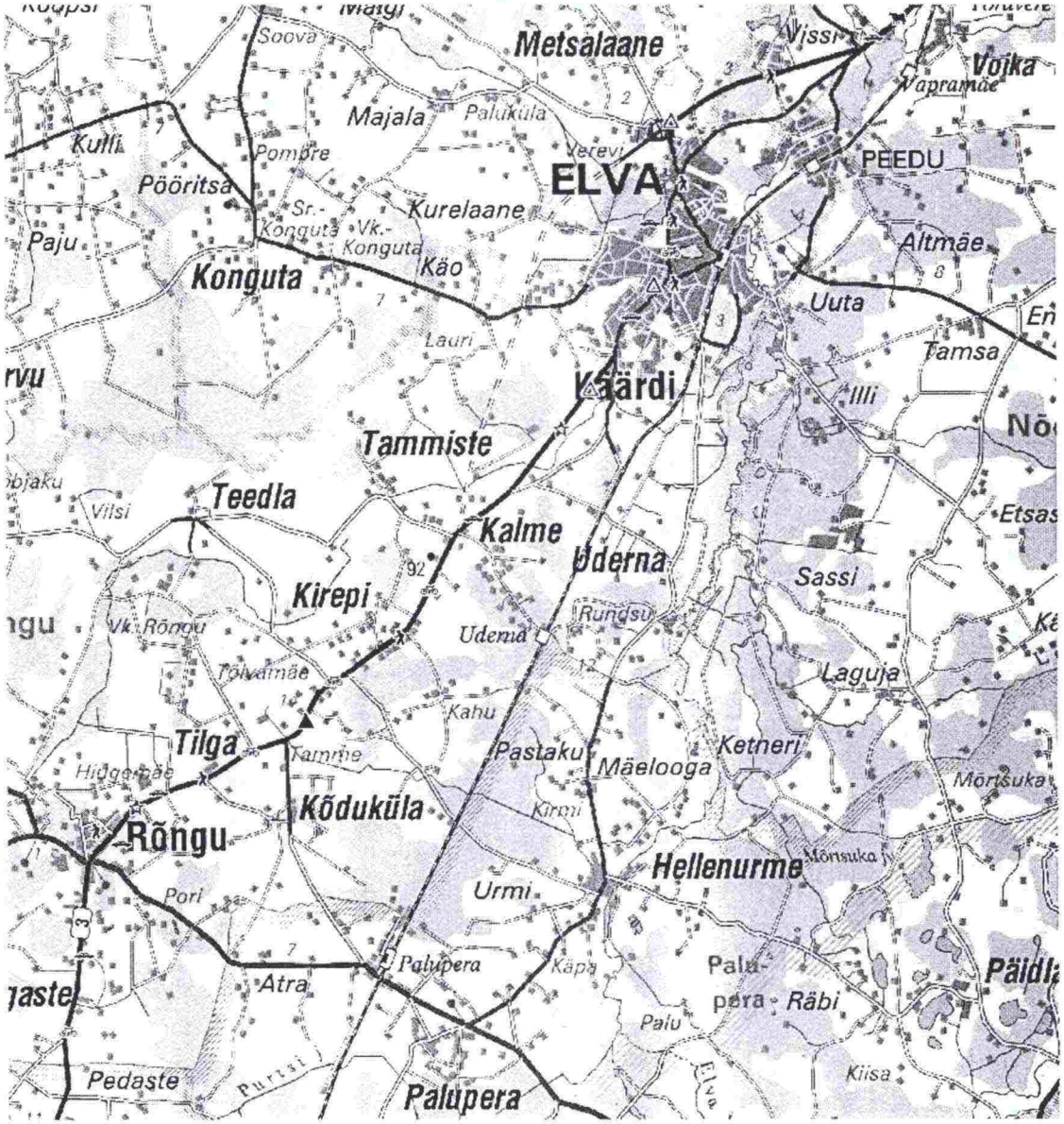
Picture 5.20. Highway 3 south of Tartu in Räni.

Picture 5.21. Black spot of Külitse.

5.4.5. Section Elva - Kalme (km 159–166)

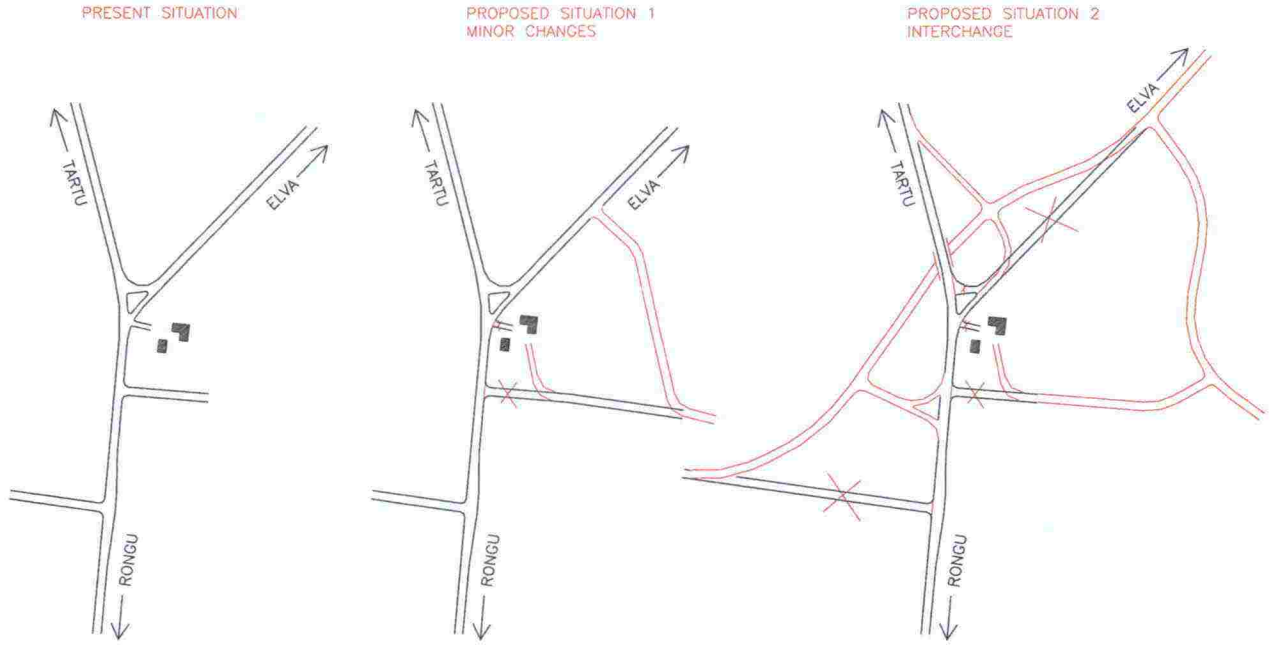
This section is brand new, while it is taken to use in autumn 2000. The alignment is mostly straight and the sights (large curve to south left) are mostly excellent. The guide posts are erected every 50 metres and there are no minor junctions. AT sees although the most hazardous spots on this section are the intersections. Many of the intersections have been built in the X-form although there would have been space enough to stagger them or to multigrade them.

Picture 5.22. Interchange for Elva on the new by-pass section.



Picture 5.23. Accident locations between Elva and Rõngu.

One of the most hazardous intersections is situated in Kalme in the southern end of the by-pass of Elva. There are too many intersections to the main road at one spot. To make even more confusion a yard access is allowed to a place, where old highway exits towards Elva. Two possible solutions are presented to replace the current situation (see picture 5.24.). Main purpose of the proposed solutions is to minimise the amount od the intersections on the main road.



Picture 5.24. Intersection at the end of the by-pass of Elva in Kalme.

5.3.6. Section Kalme – Border of Valga province (Rõngu) (km 166–180)

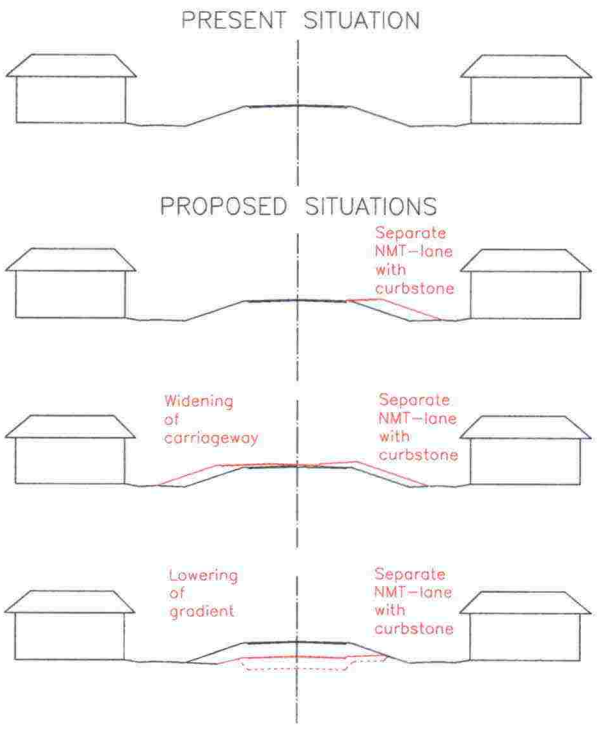
This section can further be divided to two different parts; first part is in unurban area with old pavement and the second part is in built-up area in town Rõngu. The first part outside the urban area is going to be repaved in year 2001. At the renovation of the old surface also the road markings, guide posts and road signs must be renewed. Optimal would be if the asphalt shoulders could be widened, while there are definitely some non-motorised traffic moving on this part of the road.

The second part of this section is awhile renovated (=repaved). Speed limit is set to 50 km/h in urban area and even 40 km/h in the centre of Rõngu. Any major changes in road construction hasn't been done. Normally the road sign showing speed limit hasn't sufficient effect on speeds. Usually constructive actions are insisted to lower the speed permanently in urban areas. In Rõngu this would need effective "gates" both sides of town showing when you are entering into urban area.

A separate pedestrian way exists only in the centre of Rõngu. This separate NMT-lane or way should be lengthen both sides of the town. The best solution is to construct the NMT lane on the side of the lighting.

In Rõngu the road is situated on a embankment both sides of the town. The houses are quite close to the road, so in some places it might be difficult to construct a separate NMT-lane. Some possible solutions are presented in the picture 5.26. The solution suits the best to the town landscape and needs less extra road area is the lowest, where gradient of the road is lowered.

Picture 5.25. Old road between Kalme and Rõngu.



Picture 5.26. Rõngu cross-section.

Picture 5.27. Main intersection in Rõngu

5.4. Recommendations on the introduction and the development of the Road Traffic Safety Audit in Estonia

As said in the previous chapters, traffic safety audit system is not a recognised system in Estonia yet. There are also no plans on taking it to use in the near future. AT although sees, evident benefits could be reached by generating an own traffic safety development system. The system could be quite similar to the auditing method, or it would be similar to it, like the system in Finland nowadays is. Above all the benefits of the system originate, when simple and inexpensive ideas are instantly put to use.

The recommendation to the auditing system is following; first of all new projects and plans are audited in order to get same safety standards for the new road arrangements, besides all plans in the area of municipality (e.g. local streets) could be audited. This demands also the approval of municipal authorities. Auditing of the existing plans is important, while the planning engineers are not always very familiar with the latest traffic safety know-how. To change the plans, when they only exist on paper, is also the most inexpensive way to improve traffic safety.

If there are resources after the auditing of all public and municipal plans, it should be considered to audit the existing roads. The auditing of the existing roads is especially important, when preparing the programme for minor (little budget) traffic safety improvements. The programme that will be generated by auditing should be reasonable and feasible. Realising such a programme normally produce the most profitable improvements of traffic safety. If the amount of new plans is small, more resources could be put in use to audit the existing roads. Important, when choosing the auditing personnel, is that same person or group could perform the audits nation wide in order to perform the same plan of action.

The auditing of the existing roads could be repeated every 5...10 years for the same road. AT sees appropriate gap for the main roads could be 5 years, lower class roads 10 years. Resources decide whether all roads or the roads with certain classification should be audited. Also the gap between two audits on the same road depends on the resources. If the auditing system of the existing roads is adopted, the road should be audited, when its classification or standard changes.

REFERENCES

1. Teed ja Liiklus Eestis 1997-1998, Road and Traffic in Estonia 1997-1998, IB Stratum, Tallinn 1999
2. Lithuanian Road Traffic Safety Audit, Finnra, Vilnius 2000
3. Latvian Road Traffic Safety Audit, Finnra, Riga 2001

ANNEXES

1. Terms of references
2. Accident information of Jõgeva county
3. Protocol from the safety audit kept on 11th and 12th of December 2000
4. Check-lists for safety audit

Note: These check-lists are advisory and enclosed as a model and basics for the future use.

RIIGI MAANTEEAMET
Jõgeva Teedevalitsus

Analyze of accident data on road No 3 Jõhvi-Mustvee-Valga 69,3 – 109,2 km, according Police register of Jõgeva county in 1992-2000.

No.	km.	Date	Fatal	Injury	Description
1.	71	07.06.92.	-	-	collision with animal drawn vehicle in the dark.
2.	71	27.12.92.	-	-	turn over in the slippery condition.
3.	72	06.11.92.	-	1	running off the road in the fog.
4.	74	06.06.92.	-	1	collision with motorbike and animal.
5.	78	18.09.92.	1	-	collision with pedestrian.
6.	89	15.10.92.	-	-	running off caused by technical fault of truck.
7.	91	18.07.92.	-	-	Infringement of yielding.
8.	97	25.12.92.	-	-	running off caused by slippery road.
9.	98	10.01.92.	-	-	running off caused by slippery road.
10.	99	24.05.92.	-	-	rear end collision with the towing truck in the dark.
11.	103	04.12.92.	-	-	running off caused by slippery road.
	1992. TOTAL:		1	2	
1.	75	20.09.93.	-	-	hit the tree caused by broken front axle.
2.	76	09.01.93.	-	1	collision with pedestrian walked out behind the bus.
3.	76	08.08.93.	-	-	Running off the road.
4.	78	03.06.93.	-	2	turn over caused by exploded tire.
5.	80	25.07.93.	-	-	Infringement of yielding.
6.	84	18.10.93.	-	-	turn over caused by slippery road.
7.	86	23.08.93.	-	-	collision with obstacle on the road.
8.	90	13.06.93.	-	-	Running off the road and turned over.
9.	105	30.07.93.	-	-	front collision.
10.	105	10.11.93.	-	-	front collision caused by the fog.
11.	109	05.12.93.	-	-	running off the road to the river caused by slippery.
	1993.a. KOKKU:		-	3	
1.	76	08.08.94.	-	1	collision with child when reversed on the shoulder.
2.	77	21.03.94.	1	-	collision with pedestrian on the road.
3.	87	29.05.94.	-	1	Running off the road and turned over
4.	88	23.03.94.	-	-	turn over caused by slippery road.
5.	96	29.06.94.	-	-	turn over.
6.	97	04.09.94.	-	4	side collision on overtaking.
7.	100	07.08.94.	-	-	front collision with car and trailer.
8.	104	15.02.94.	-	-	collision with wild animal.
9.	106	31.08.94.	-	3	rear end collision.
	1994.a. KOKKU:		1	9	
1.	69	10.11.95.	-	-	turn over.
2.	72	13.08.95.	-	-	collision with left turning and overtaking car on junction.
3.	72	21.08.95.	-	-	collision with left turning and overtaking car on junction.
4.	78	21.07.95.	-	-	collision with stopped car.
5.	79	26.08.95.	-	-	side collision caused by yield infringement.

Jaama 2
48305
JÕGEVA
reg.nr.70001544

tel *juh* (277) 62 062
sekr (277) 62 060
faks (277) 62 061

E-mail: jogevatv@jtv.jogevamv.ee
arvelduskonto 10102021864003
Eesti Ühispanga Jõgeva Harukontor
kood 401

R I I G I M A A N T E E A M E T
Jõgeva Teedevalitsus

6.	79	26.11.95.	-	-	turn over.
7.	81	13.06.95.	-	-	side collision caused by yield infringement.
8.	82	15.03.95.	-	-	side collision caused by yield infringement.
9.	83	04.09.95.	-	-	side collision caused by yield infringement.
10.	85	10.11.95.	-	-	side collision caused by yield infringement.
11.	90	10.11.95.	-	-	turn over.
12.	95	29.08.95.	-	-	side collision caused by yield infringement.
13.	99	12.11.95.	-	-	collision with left turning and overtaking car on junction.
14.	101	27.01.95.	-	-	Running off the road and turned over.
15.	101	20.03.95.	-	-	collision with wild animal.
16.	102	11.11.95.	3	1	front collision in slippery conditions.
17.	103	03.04.95.	-	3	Running off the road and hit the tree.
18.	105	27.07.95.	-	-	turn over caused by technical fault.
	1995.a. KOKKU:		3	4	

1.	72	23.02.96.	-	-	side collision caused by yield infringement.
2.	72	13.04.96.	-	-	Running off the road and turned over
3.	73	11.09.96.	-	-	Running off the road and turned over.
4.	73	08.11.96.	-	-	Running off the road and hit the tree.
5.	76	09.09.96.	-	-	side collision caused by yield infringement.
6.	85	12.05.96.	-	-	side collision caused by yield infringement.
7.	87	01.06.96.	-	-	Running off the road.
8.	91	22.08.96.	-	-	side collision with bus caused by yield infringement.
9.	95	30.06.96.	-	-	Running off the road.
10.	98	26.09.96.	-	-	collision with stopped car.
11.	104	10.10.96.	-	-	collision with animal.
12.	107	27.06.96.	-	-	Running off the road and hit the tree caused by broken steering link.
	1996.a. KOKKU:		-	-	-

1.	75	02.02.97.	-	-	collision with stopped car.
2.	75	02.07.97.	-	3	Running off the road and turned over.
3.	78	04.05.97.	-	2	Running off the road and turned over.
4.	78	26.10.97.	-	2	Running off the road and turned over.
5.	80	30.06.97.	1	5	side collision with overtaking car and turn over.
6.	84	25.11.97.	-	-	Running off the road and hit the tree.
7.	87	05.06.97.	-	-	side collision caused by yield infringement
8.	92	09.10.97.	-	3	front collision caused by drunk driver.
9.	99	21.11.97.	1	-	Running off the road to the river.
10.	101	10.11.97.	-	1	Running off the road and turned over.
11.	107	04.06.97.	-	-	rear end collision with roadwork's machine.
	1997. total .		2	16	

1.	75	10.02.98.	-	-	front collision caused by loosening the wheel.
2.	75	01.05.98.	-	-	collision with stopped car on the shoulder.
3.	76	10.01.98.	1	-	collision with pedestrian.
4.	76	10.09.98.	1	-	collision with pedestrian.
5.	76	08.10.98.	-	-	rear end collision.
6.	77	28.02.98.	-	-	collision with left turning and overtaking car on

Jaama 2
48305
JÕGEVA
reg.nr.70001544

tel *juh* (277) 62 062
sekr (277) 62 060
faks (277) 62 061

E-mail: jogevatv@jtv.jogevamv.ee
arvelduskonto 10102021864003
Eesti Ühispanga Jõgeva Harukontor
kood 401

RIIGI MAANTEEAMET
Jõgeva Teedevalitsus

7.	78	29.03.98.	-	-	car reversed and hit the bus.
8.	79	31.05.98.	-	-	Running off the road and hit the tree.
9.	80	22.07.98.	-	4	Running off the road and turned over.
10.	81	06.11.98.	-	-	collision with animal.
11.	89	28.09.98.	-	-	side collision caused by yield infringement.
12.	94	21.12.98.	-	1	Running off the road.
13.	96	23.12.98.	-	-	collision with stopped car on the shoulder.
14.	98	11.05.98.	-	-	Running off the road and turned over.
15.	102	17.09.98.	-	-	Running off the road.
16.	106	16.06.98.	1	-	side collision with motorbike and truck caused by yield infringement.
17.	107	09.06.98.	-	-	Running off the road and turned over.
	1998.	total .	3	5	
1.	72	24.06.99.	-	-	side collision caused by yield infringement.
2.	76	02.01.99.	-	2	Running off the road.
3.	76	23.01.99.	1	-	collision with pedestrian on the road.
4.	78	07.08.99.	-	1	front collision.
5.	96	18.06.99.	-	-	collision with left turning and overtaking car on
6.	99	03.05.99.	-	1	collision with stopped car on the shoulder.
7.	102	26.12.99.	-	1	Running off the road and turned over.
8.	103	03.03.99.	-	-	rear end collision.
9.	107	09.09.99.	-	-	collision with wild animal.
	1999.	total :	1	5	
1.	69	03.03.00.	-	1	Running off the road and turned over.
2.	80	15.03.00.	-	3	Running off the road and hit the tree.
3.	85	10.06.00.	-	-	Running off the road and hit the tree.
4.	87	17.02.00.	-	-	collision with animal.
5.	94	28.10.00	-	2	collision with stopped car on the shoulder.
6.	97	01.10.00.	-	-	collision with overtaking and U-turning car.
7.	101	15.10.00.	-	1	collision with overtaking and U-turning car.
8.	91	11.12.00.	-	-	Running off the road and turned over.
2000.a. 19.dec. total:			-	7	

Completed by Arnold Narits, Traffic Safety specialist of Jõgeva county.

Jaama 2
48305
JÕGEVA
reg.nr.70001544

tel *juh* (277) 62 062
sekr (277) 62 060
faks (277) 62 061

E-mail: jogevatv@jtv.jogevamv.ee
arvelduskonto 10102021864003
Eesti Ühispanga Jõgeva Harukontor
kood 401

Estonian Road Traffic Safety
Protocol from Highway No 3
11th and 12th December 2000

Km	Marking
0	Jõhvi town area, pedestrian way on the right, partly 2+2 lanes, where central reserve with trees. Some traffic lights inside Jõhvi, the zebra crossings poorly marked.
2	Bridge above the railway (speed limit 30 km/h, weight limitation of 8 t.), lighting, no pedestrian lane on the bridge, wide cross-section. After the bridge several turns, where the highway is given the priority, separate pedestrian way (short track)
4	Lighting ends, speed limit 70 km/h, where also ERA's responsibility starts
5	Narrow asphalt shoulder, gravel shoulder width varies. Intersection of Tammiku, which is partly lighted on the right , separate right-turning lane and pedestrian crossing.
7	Railway crossing over the road, no advanced guidance of the crossing, no warning equipment.
	Lighted intersection to left, speed limit 70 km/h.
	Guide posts app. in intervals of 50 metres
	Railroad crossing, warning lights, no other warning equipments.
	Normal cross-section continues, asphalt shoulders app. 0,5 m wide, guide posts 1 m away from edge of the pavement. Carriageway-markings ok.
12	Bus stop without decent bus bay, stop exactly at one intersection (Kalina). In consequence of no km-posts the exact locations are hard to measure.
13	Intersection for Pagari on the right. Crossing quite indefinite.
	During the by-pass of Pagari the gravel shoulders are wider.
17	Intersection for Kohtla-Nõmme, fuel station, channelised intersection, where separate right- and left-turning lanes and an acceleration lane. Both bus-stops after the intersection (southside). After intersection the road continues quite wide.
22	Intersection to mine (Eesti Kaevandus), separate left-turning lane. Both bus-stops after the intersection.
	Bridge, whereafter ramps on both sides at the location of bus-stop.
31	Tärivere, the barrier is missing though the road is situated on a high embankment.
34	Iisaku urban area, shortly reconstructed, while the pavement seemed quite new. In the beginning steep turn to left. At this location also an intersection (Tudulinna) is situated. In the urban area itself separate pedestrian way on the right side. A pedestrian crossing over the road in the centre, lighting, wide cross-section. Beside the road some trees. On the southside of the village there is a fuel station at the location, where also the urban area ends. Intersection to Alajõe at the same location.
	After Iisaku the asphalt shoulder disappeared. Surface treatment used as the uppest pavement type. Some houses very near to the road.
40	Intersection to Kuru, no lane arrangements, pavement ok, includes an asphalt shoulder as well. After the intersection the alignment is quite bendy.
47	In Kauksi an intersection to Vasknarva (Kuru and Alajõe), steep turn to right, bus top at the intersection, separate right turning lane from Mustvee direction.
50	After the intersection again curvy alignment, Rannapungerja village, no speed change.
	Intersection to right (Rakvere), limited speed 70 km/h.
	Narrow road at one stream, narrow culvert or bridge, after the culvert an intersection to right to Raadne.
	Lohusuu, like before, narrow culvert.
	Avi jõgi, bridge wide enough.
62	Intersection to Avinurme to right, village of Tammispää begins.
63	Shoulders narrow, cafeteria on the right, wide parking area on the left. Some trucks on the rest area, in summers used surely by the people visiting the beach.
	Narrow road (some culverts), speed limit 70 km/h, small village of Ninasi. Houses both side of the road, some trees beside as well. Bends restrict sights in the road direction. Bus stop without any bay.
65	Village of Kalmaküla, houses less than in Ninasi.
	Intersection to Avinurme to right, after that intersection to left to Mustvee, after intersections the speed limit 70 km/h ends.
	Province changes from Ida-Virumaa to Jõgeva. No more sidemarkings on the pavement. In Jõgeva maakond the km-posts begin. First marking on the 70 km-stand.

70	Fuel station, lane arrangements to right, where the fuel station exists. After that main crossing for the town of Mustvee. Intersection type very exciting; decentralized crossing. This intersection type is known safer as normal crossing. The drainage condition of the intersection is although poor.
	Bridge just after the intersection.
73	Only the middle line is marked, no side markings.
75	Intersection to left to Mustvee; after the intersection begins section with Raja-village on the left. The inhabitants of Raja gather beside the road to sell their articles to the passer-bys. This action inflicts traffic safety and causes accidents regurarly.
79	Intersection to Kasepää, no lane arrangements.
	Emergency runway, asphalt pavement not so wide, but gravel shoulders are. Was created for a landing place to secure the route Tallinn-Tartu.
82	After the runway narrow road at the Saare jõgi,
86	Warning for holes on the road, speed limit is set to 70 km/h for heavy traffic, quite uneven, the crossfall of the pavement varies quite much, partly on a high embankment without any barriers. Partly no guide posts.
	Overtaking markings were painted partly with two lines, partly with one line.
	X-crossing to Levala and Saare, renovated section starts, new section has some drainage problems, the ditches don't operate well. New cross-section has wider shoulder (0,5 m asphalt shoulder) on the right side, on the left side no asphalt shoulder at all. Guide posts appear every 50 metres.
93	Crossing to Torma and Voore, enough space for by-pass zone, yard junction on the opposite side.
96	Crossing to Jõgeva and Palamuse to right , separate left turning lane from the opposite side.
97	Crossing to left to Kodavere, Pala and Kallaste, separate left turning lane.
101	Crossing to Tabivere and Maarja to right, bus stops without any bays.
	X-crossing to Kaiavere and Alatskivi.
	Narrow bridge and a curve to left, Province of Tartu begins.
110	Bridge of Elistvere, another narrow bridge. Intersection to right, bus stops situated only on the southern side of the intersection. Shoulders almost 1 m wide (partly from gravel) , carriageway markings ok, guide posts app. every 100 metres.
114	Crossing of Vedu, old-type lane-amrkings, which were quite worn-out.
115	Crossing to Kikivere, lane arrangements.
119	Crossing for Ammejõgi, warning of narrow bridge, speed limit is set to 70 km/h. Separate right turning lane, by-pass zone on the opposite side, bus-stops again only on the southern side of the junction. Quite steep curve in the crossing.
122	Crossing of Koosa and Luunja roads to left in Aovere. These two roads are connected together before the intersection to form only one T-juction to the Highway 3. Also a fuel station is situated in the crossing. The crossing itself is situated in a sharp right curve on a hill. Speed limit is set to 70 km/h. Intersection has separate right turning lane from Tartu direction.
123	More land-use (and junctions) both sides, when drawing nearer to Tartu, no lane arrangemants and no seprate NMT-arrangemants. Sights are quite good, lane markings are worn-out.
124	Intersection to left to Vesneri.
	Warning of children at Kõrveküla. Minna Härmä sünnikodi- intersection. Lighting at the bus-stop.
	Before the main intersection to Tartu one separate juction, which is guided to Tartu. It has lane arrangements and by-pass zones.
	Main crossing to Tartu. Road ends to T-type intersection, where separate left and right turning lanes. Left turning lane leads to Tartu. Right turning lane to P39. On the opposite side quite sharp curve from Tartu to Jõhvi, has lead to some overturns. After the turn to Tartu 70 km/h speed limit sign, Tartu built-up area sign.
	Guidance from Highway 3 through Tartu is discontinued. It first goes through housing areas and turns then to 4-lane road (bridge leading over Emajõgi). After the bridge turns to right to spiral ramp and continues to south through industrial area. Here the guidance ends. If driven in the main direction, it will lead to Highway no 2, where is a connection northwards to Highway 3.
	After Tartu the governmental road management responsibility starts again. In the beginning there is a 2-lane-roundabout, where 4 roads cross (Highway 2, Highway 3 and the road from Tartu). It is only lighted in the Tartu direction. After the roundabout there are bus-stops both sides of the road. The road continues wide, although the shoulder surface is mostly of gravel (2...3. metres). In the beginning part there are also number of junctions. Plenty of fuel stations appears quite well. No separate NMT-lanes.
138	Lane markings are worn-out and the guide posts are installed app. every 100 metres.
142	Village of Külitse, very wide cross-section at the scene due to e.g. bus stops.

143	Crossing to Haage to the right
145	Crossing to Nõgiaru to the right
146	Crossing to Nõo to laft, has lane arrangements.
149	Staggered X-crossing to Nõo and Rõhu first junction to left, the second to right. Adequate guidance. Quite the opposite were the intersections before, which didn't have any advanced guidance. A house near the road, protected with barrier.
153	Intersection to right to Meeri, lane arrangements, also a warning of children.
155	Bridge, whereafter bus-stop and a staggered crossing, first crossing to right and second to left. Crossings were although quite near to each other.
158	Interchange of Elva. Acceleration and exit lanes ok. After the interchange a bus stop and a yard connection to left. Guide posts every 50 metres on the by-pass of Elva.
160	Some yard connections to the by-pass.
161	X-crossing
162	X-crossing, with large lane arrangements, from both sides three lanes, after the intersections a barrier on the left side due to high embankment.
163	Minor X-crossing, no guidance.
165	Minor X-crossing, no guidance.
166	End of the by-pass, large crossing with several accesses and bus stops. After the intersection begins the old section with old pavement and no guide posts.
171	Begins better pavement, guide posts also exist. Speed limit of 70 km/h, after that built-up area sign (Rõngu).
173	Lighting, lot of yard accesses, no NMT-lanes, the houses beside situate lower from the road, parking beside the road. Main intersection (Viljandi) in Rõngu with 40 km/h speed limit, parking prohibited.
	Zebra crossing at the local shop, parking restrictions end.
174	Lighting and built-up area end.

ESTONIAN ROAD TRAFFIC SAFETY AUDIT
Check-list for existing roads/ Alignment and cross-section

Road section:
Date:
Responsible person for checking:

NR.	*Description*	*OK*	*Comments*
1.	Alignment, gradient and visual ranges; Is the alignment in harmony (bends and straights)? Is the optical guidance in order? Does the alignment and gradient fulfil the visual ranges on intersections and on sections between them? Do the equipment (road signs, plants, barriers and other obstacles) limit the sight now or in the near future? Does the standard of the road correspond to the speed of the traffic?		
2.	Cross-section; Is there a need somewhere for a curb stone? Is there enough space for all road users? Is the separation for various road users sufficient? Are the places, if any where a two-lane road changes into a four-lane road, fully marked? Is the shape of the model cross-section safe and sufficient for drainage and snow storage? Do the banks slope gently enough?		
3.	Shoulders; Are the shoulders too steep? Are the shoulders marked with reflected posts? Does the installation of the posts increase traffic safety?		
4.	Sidefall, drainage; Is the sidefall in order? Is the levelling of carriageway and shoulders all right? Are the ditches working properly?		
5.	Pavement; Is the pavement in order? Is the type of pavement right for the specific section? Is the pavement damaged through frost heaving? What defects (rutting, cracking, edge break, etc) does the pavement have? Is there enough friction on the pavement for different climate conditions?		

ESTONIAN ROAD TRAFFIC SAFETY AUDIT
Check-list for existing roads/ Intersections

Road section:
Date:
Responsible person for checking:

NR.	*Description*	*OK*	*Comments*
6.	<u>Intersections;</u> Is the intersection from all incoming directions visibly marked? Are all the exiting directions of an intersection clearly marked? Are the road markings, turning lanes and ramps in order? Are there any obstacles in the intersection? Can all vehicle types drive through the intersection safely? Is there enough space for large vehicles? Are any of the incoming directions too steep for heavy vehicles? Is the crossing of non-motorised traffic in order? Does parking near an intersection cause problems? Are there enough incoming and exiting lanes in the intersection? Are the middle islands visible and in the right place? Is there enough space for left-turning vehicles? Would changing the intersection type increase traffic safety in the intersection? Is the speed limit in the intersection suitable? Should there be an advanced warning of the intersection? Is there enough space for pedestrians crossing? Are all the intersections necessary? Should some or all private intersections be forbidden?		

ESTONIAN ROAD TRAFFIC SAFETY AUDIT
Check-list for existing roads/ Transport modes and land use

Road section:
Date:
Responsible person for checking:

NR.	*Description*	*OK*	*Comments*
7.	Non-motorised traffic (NMT); Is there a need for separate a NMT-lane? Is there a separate NMT-lane? Is it in good shape? Is it used? Is the cross-section of the NMT-lane sufficient? Are there places where the gradient is too sharp? Are there enough crossings (incl. under- or overcrossings) for the NMT? Is the limited observation ability of children and elderly people taken into account? Can disabled persons use the crossings comfortably? Are the NMT-amounts known? Is there a need for fences to prevent NMT from crossing?		
8.	Public transport; Are bus stops located properly? Is the waiting area large enough for the expectant people? Is the connection from the bus stop to the road sufficient? Are the pedestrian routes to/from bus stops sufficient?		
9.	Parking; Is parking allowed aside of the road? Should parking be restricted? Are there parking and resting areas on the road? Is there a need for a parking or resting area?		

ESTONIAN ROAD TRAFFIC SAFETY AUDIT
Check-list for existing roads/ Driving

Road section:
Date:
Responsible person for checking:

NR.	*Description*	*OK*	*Comments*
10.	Speed limit; What is the average speed of the road section? Is the speed limit realistic (also during the winter)? Is it in harmony with the alignment and cross-section of the road? Is there a need for speed limit changes in a order to increase traffic safety?		
11.	Overtaking; Are there enough places for overtaking? Is there a need for an overtaking or climbing lane? Are there sections, where the overtaking should be restricted?		
12.	Accidents and driving behaviour; Are there signs of conflicts or small accidents on the road (skidmarks, broken pieces of glass etc.)? Are people afraid of some places on the road? Are animal accidents typical for this type of road? Would building a femce prevent animals from entering the road area? Are people following the traffic regulations? Which regulations are typically violated?		

ESTONIAN ROAD TRAFFIC SAFETY AUDIT
Check-list for existing roads/ Maintenance and road works

Road section:
Date:
Responsible person for checking:

NR.	*Description*	*OK*	*Comments*
13.	<u>Maintenance;</u> Could maintenance work be done more safely? Can maintenance vehicle park safely aside the road?		
14.	<u>Road works;</u> Is the advanced warning sign sufficient? Is there a temporary speed limit? Is there a temporary signal system? Are traffic signals properly installed and sized? Are the critical places lighted (e.g. canals)? Is the safety of the road workers in order? Are all road user groups taken care of when planning detours etc.? How is traffic control organised after working time?		

ESTONIAN ROAD TRAFFIC SAFETY AUDIT
Check-list for existing roads/ Traffic control

Road section:
Date:
Responsible person for checking:

NR.	*Description*	*OK*	*Comments*
15.	<u>Road signs and markings;</u> Are the road signs in a good shape? Is the traffic control continuous? Is the information on the road signs clear? Are there too many road signs in one place? Are all of the road signs useful? Do the signs work together with the road markings? Are the road signs in a safe distance from the road shoulder? Do certain road signs cover other signs so that they cannot be seen? Are the signposts from flexible material? Is the text of the road signs intelligible? Are there hazard-marking signs at road bends? Is there an emergency phone system? Is it in working condition? Are the markings in a good shape? Are there places, where the road markings are fading?		
16.	<u>Traffic lights;</u> Are all the traffic signals visible from the incoming direction? Is there an advanced warning for the traffic lights? Is the speed limit suitable? If there is a coordinated signal control, are there problems with it? Is it usual that there are parked vehicles near the crossing? Should parking be prohibited? Is there a possibility, that sunset/rise or the lighting causes problems, when observing the traffic signals? Are there any improvements that can be made for vehicles (prevent against red driving, lapping green, road marks)? Are there any improvements that can be made for pedestrians (prevent against red walking, rails, press buttons, lighting)?		

ESTONIAN ROAD TRAFFIC SAFETY AUDIT
Check-list for existing roads/ Road devices and special structures

Road section:
Date:
Responsible person for checking:

NR.	*Description*	*OK*	*Comments*
17.	Bridges; Is the bridge cross-section suitable for the road? Is there enough space for non-motorised traffic? Is the bridge fully marked? Are the bridge barriers in order and properly sized? Is the pavement material in order? Can the bridge be icy during the winter?		
18.	Tunnels; Is the cross-section suitable for the road? Are there widening or other emergency systems in the tunnel? Is the tunnel lighted sufficiently?		
19.	Lighting; Are the lights in a good shape? Are the lighting posts duly installed? Are the road signs lighted? Is the distance of the posts from the shoulders safe enough? Do the posts block road signs or visual range? Are there non-lighted areas that could produce dangerous situations? Can the lighting of other areas/roads cause problems? Do the lighting posts yield?		

20.	<u>Plants;</u> Do plants prevent visibility? Can plants grow directly onto the equipment (signs, posts)? Is the distance of the plants (especially full-grown trees) from the road shoulders safe? Do plants affect the drainage (for example ditches are not working properly)?		
21.	<u>Drainage equipment;</u> Are the manholes and sewers in order? Are they correctly dimensioned? Are the decks of manholes properly levelled? Are the culverts of the main and side roads in a good shape? Are the culverts correctly dimensioned?		
22.	<u>Equipment cabinets;</u> Is the route to device-cabinets safe? Should the cabinets be equipped with fences?		
23.	<u>Possibility of crashes on the equipment;</u> Are there places, where the equipment needs barriers/safety fences?		